# JOURNAL

OF THE

# FRANKLIN INSTITUTE

OF THE

## State of Pennsylvania,

DEVOTED TO THE

MECHANIC ARTS, MANUFACTURES, GENERAL SCIENCE,

AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS.

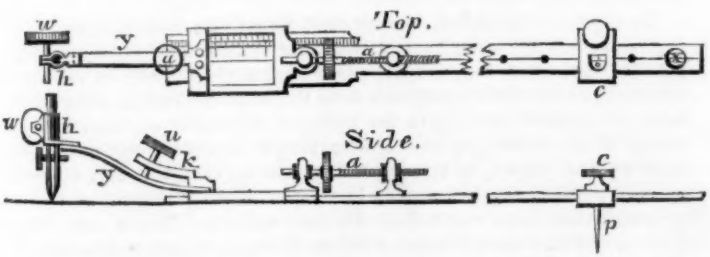
SEPTEMBER, 1835.


FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

### *Description of a Beam Compass, contrived by* John C. Trautwine, *of Philadelphia, Architect and Engineer.*

TO THE COMMITTEE ON PUBLICATIONS.

Having recently had occasion to draw several maps of rail-road surveys, on a large scale, I was at a loss for a beam compass, of a length sufficient for striking the curves, and, in consequence, contrived, for that purpose, the one here described.




Finding it to answer in a very satisfactory manner, and thinking it might, in the absence of a better, be useful to others, I submit it for insertion in the Journal, provided it be considered of sufficient utility.

The instrument consists of a strip of brass, (mine is three and a half feet long, half inch wide, by one twelfth inch thick,) having its edges rounded, to prevent its catching in any inequalities in the paper, and being divided and numbered into feet and inches, or in any manner that may be preferred.

Precisely in the centre line of the strip, and at each point of division, is carefully drilled a very small circular hole, entirely through the brass, and barely large enough to admit the finest sewing needle. Pains must be taken to drill these holes *precisely vertical.*

At that end of the beam where the numbering of the divisions commences, is a sliding vernier, by which the divisions may be subdivided into hundredths of an inch. This slide is moved along the end of the beam, by means of the screw, *a*, and is furnished with a holder, *h*, into which a pencil, or drawing pen, may be inserted. It has also a screw, *u*, which, by operating on the stiff piece of brass, *k*, above, and the elastic piece, *y*, below, forces the pencil, with any required degree of pressure, against the drawing. The lower piece, *y*, is elastic, that it may, by yielding, allow the pencil to play over any roughness, or knots, that the paper may contain; and is very essential to the drawing of a clear, unbroken line. *c* is a sliding piece of brass, with a point, *p*, and a semicircular hole, *o*, on top, (for seeing the dimensions on the beam.) It will often be found useful for ascertaining the centre of a circle by trial, when it is inconvenient to do so by calculation.

As the size and proportion of the parts of the slide, (particularly of the spring and pen,) are of great importance, and mine are the result of several trials, I have represented them at one-quarter the full size, to enable others to make them with certainty at the first attempt.

The drawing ink should be perfectly clean and free from dust, and of a certain degree of fluidity, which a few trials will point out.

The paper should be brushed with a clean handkerchief, to remove dust, before beginning to draw the curves.

The dimensions above stated I consider sufficient for beams six feet long, which gives a diameter of twelve feet, a size which is very rarely exceeded in neat finished drawings on paper.

For radii less than three feet in length, both the breadth and thickness of the strip may be reduced.

To use the instrument, having first found the centre from which the curve is to be described, drive a fine needle firmly and vertically into it; and over the needle, place that division hole of the beam which more nearly corresponds with the required radius; after which, bring the pencil *precisely* to the point of beginning of the curve, by means of the screw, *a;* and after giving it a proper degree of pressure on the paper, by turning the screw, *u*, describe the curve by merely pushing the beam over the paper, without any other vertical pressure than what arises from its own weight. When one line is drawn, and the pencil is to be taken back, to commence another, it may be raised from the paper, either by unscrewing *u* a little, or by slightly lifting the whole slide. It will not be necessary to lift the beam off the needle, for the purpose of altering the position of the

pencil, for drawing concentric curves, whose difference of radii does not exceed the play of the slide, as that may be done much more readily by the screw, *a*.

In this manner, any number of curves may be described from one point, without the least enlargement of the centre hole in the paper; a defect to which all other beam compasses I have ever seen, are liable. This is subject to so little spring, or irregularities of any kind, that I have, in the width of *one inch*, described *one hundred* concentric curves, *of seven feet diameter*, precisely equidistant, with as much neatness, accuracy, and clearness, as I could have drawn the same number of small ones, with a pair of common six inch dividers.

The instrument is peculiarly adapted to cases where the centre is on the same plane as the drawing, and where the beam will be supported throughout its entire length, or where it may be upheld by intermediate supports, sufficiently near each other to prevent any degree of sagging; but where it is impossible to support it between the centre and the pencil, it is not by any means to be recommended.

When the curves are finished, the needle may be easily withdrawn, either between the legs of a pair of common dividers, or between the blade and back of a penknife. A hole, *x*, should be made in the beam, for hanging it up.

These beams are kept ready made, for sale, by Mr. William J. Young, mathematical instrument maker, of this city.

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## *Description of a Diving Dress, invented and used by* Charles Condert, *of Brooklyn, New York.*

TO THE COMMITTEE ON PUBLICATIONS.

Gentlemen,—

The diving dress described in this communication, and the disaster connected with it, have been recalled to my recollection from noticing several recent patents for submarine apparatus. It appears to possess some peculiar features, and seems well calculated for small depth; no metallic or other inflexible material is used in its construction, or in connecting the two portions of it together. It is put on and off with the same facility as an ordinary dress, and, when in use, the body is in full possession of its natural flexibility of motion.

It was invented (and frequently used) by Mr. Charles Condert, a machinist, employed in a factory on the margin of the East river, in Brooklyn, opposite this city. In the docks adjoining the work-shop, he repeatedly descended in it, in from sixteen to twenty feet water. While thus engaged, in August, 1832, he fell a victim to his enterprise. The air in the reservoir had become expended, or, from some accident, (probably by his falling,) it had escaped, as the tube that conveyed the air from the reservoir to the interior of the dress, was found broken, when hauled up. He was, of course, instantly suffocated.

Like Mr. Spalding, the improver of the diving bell, he perished in

the bloom of life, at a distance from his family, and in the prosecution of his favourite pursuits. If a description of his dress be inserted in the Journal, it will probably be the only memorial of this ingenious, persevering, and unfortunate mechanic.

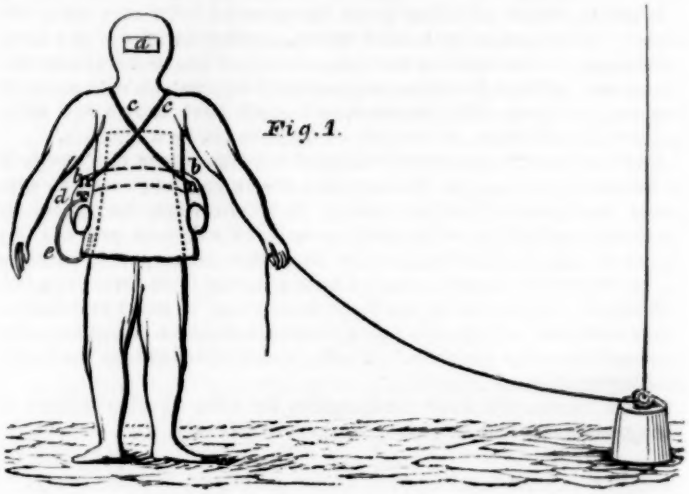



*Fig. 1.*

The dress consisted of two parts, made of cloth, coated with gum elastic; the under part was a pair of pantaloons, with India rubber shoes; this portion of the dress extended up to the arms, and was supported by suspenders. The other part embraced the head, arms, hands, and the body as low as the hips, descending over the pantaloons about twelve inches. A piece of glass was fixed opposite the eyes, as at *a*.

His method of obtaining a supply of air, was by condensing a sufficient quantity into a portable reservoir attached to the dress. It consisted of a copper pipe, *b b*, six inches diameter, and four feet long, closed at both ends, and bent into the form of a horse shoe. Two or three staples were soldered on the upper part, to receive hooks attached to the ends of suspenders, or slings, which supported it. Into this pipe he condensed, by a pump, (formed of a gun barrel) as much air as he supposed would be required for the time he intended to remain under water. A small valve cock, *d*, near one end of the reservoir, admitted air into the dress, when required; by opening this valve, a small pipe, *e*, from which entered two or three inches under the lower edge of the upper dress, or jacket, where it folded over the under part. The air escaping from it, of course, entered the dress, and kept it inflated, and prevented the water from entering it.

As the air was respired, it ascended to the upper part of the hood, or covering of the head, and escaped by a small aperture in the cloth, about the size of a pin's head, or less. He intended to use a

valve in its place, but found it to act tolerably well. His situation below could always be perceived by people above, from the air ascending perpendicularly over this orifice.

The round part of the reservoir embraced his back, and the two ends projected in front, on each side of him.

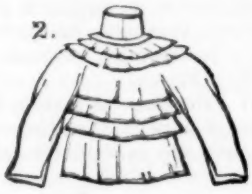
When he descended, by a rope passed through a hole made in the bottom of a boat, sufficiently large, (about two and a half feet square,) a fifty-six pounds weight was attached to one end, and suffered to sink to the bottom; another cord, attached to it, and one end held in his hand, or fastened to his arm, served to direct him to the perpendicular rope, when he wished to ascend.

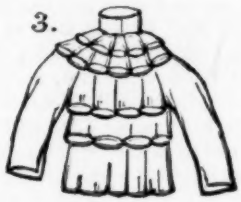
The reservoir was loaded with about 200 lbs. of lead; this load was placed too high; it would have been better to have distributed it about his legs and feet; the higher the load, the more difficult it is for the diver to rise, if he should happen to stumble, or fall.

T. E.

*New York, June*, 1835.

*Note by the Author.*—Might not the ordinary jacket of seamen be so constructed, that portions folding over each other might form receptacles of air, sufficient to prevent them from sinking, when, from accident or otherwise, they fall into water, as is shown at fig. 2? or perpendicular cells might be quilted on them, as at fig. 3, without materially changing the present appearance of the dress. In almost every position in which a person could fall into the water, some air would remain in these cells.

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*Replies to a Circular in relation to the Occurrence of an unusual Meteoric Display on the 13th of November, 1834, addressed by the Secretary of War to the Military Posts of the United States, with other facts relating to the same question.* By A. D. Bache, Prof. of Nat. Philos. and Chem., Univ. Penn.

(Communicated by the Author.)

Having found that the inference drawn from my observations on the morning of the 13th of November, 1834,* at Philadelphia, was

* See Am. Jour. Sc. & Arts, by Prof. Silliman, for January, 1835, p. 335.

directly opposite to that to which Professor Olmsted had been led, from his observations at New Haven, I felt naturally desirous to determine what might have been the extent of country over which the unusual display of meteors seen at New Haven had taken place, this extent having a direct bearing upon the question of the nature of the phenomenon. At my request, communicated through the kindness of the Chief Engineer, the Secretary at War, Gov. Cass, issued a circular to the commandants of the different military posts of the United States, requesting to be informed whether any unusual meteoric display had been witnessed at their respective posts, on the morning of the 13th of November, 1834.

The results of this inquiry, I propose now to put upon record, in as brief a manner as possible. The arrangement adopted in the record, is to begin with the most northern post on our north-eastern frontier, to pass southward along the Atlantic board; then beginning with the most southerly post of the western chain, to pass northward along that chain, then eastward on the northern frontier, towards the original point of departure. Along this line, the display of November 13th. 1833, attracted universal attention.

From Hancock Barracks, Holton Plantation, Maine, Maj. Clarke reports that no recurrence of the meteoric phenomenon of 1833, was observed on the 13th of November, 1834.

A similar report is made by Maj. M'Clintock, in relation to Fort Preble, Portland, Maine, and its vicinity.

No unusual meteoric phenomenon was observed at Fort Constitution, Portsmouth, New Hampshire, as stated by Maj. Ansart; nor at Fort Trumbull, New London, Connecticut, as stated by Maj. Saunders; nor at Fort Hamilton, New York Harbor, according to the report of Maj. Pierce; nor at Fort Severn, Annapolis, Maryland, according to Maj. Walbach; nor at Fort Washington, Potomac river, below Washington city, according to Maj. Mason.

Maj. Churchhill states that at Fort Johnston, Smithville, North Carolina, no unusual meteoric appearances were noted on the evening referred to in the circular, but that no one was particularly engaged in watching for a recurrence of the meteors of 1833.

Maj. Gale reports from Fort Moultrie, Charleston Harbor, that he can find no one in the garrison, or its vicinity, who has seen any unusual meteoric display since November, 1833; and the report of Lt. Williamson, from Castle Pinckney, in the same harbor, is to the same effect.

Capt. Marchant makes a similar report from Fort Oglethorpe, Savannah, Georgia.

From Fort Marion, St. Augustine, East Florida, Capt. Drane reports that no recurrence of the meteors had been observed, and that no remarkable meteorological occurrence was recorded about the period designated, in November.

No recurrence of the meteors was observed at Fort Jackson, on the river Mississippi, below New Orleans, commanded by Capt. G. M. Gardiner.

General Atkinson states from Jefferson Barracks, near St. Louis,

Missouri, that no occurrence of the sort alluded to in the circular, was observed in the autumn of 1834, by "any one at the post, nor was there such a recurrence any where in the west, as far as [his] inquiries, had extended."

Lieut. Col. Vose reports from Fort Towson, on the Red river, below the mouth of the Kiameche, that no recurrence of the meteors had been observed, as far as he could learn, in the section of the country in which the post is situated.

Col. Dodge, commanding the regiment of dragoons, reports from Fort Leavenworth, on the Missouri river, at the junction of the Little Platt, that no remarkable meteoric phenomenon had occurred since his arrival at the post, on the 27th of September; he adds, that "a recurrence of an event so remarkable as the one mentioned, could not have escaped the notice of the sentinel on post."

From Fort Snelling, Falls of St. Anthony, Upper Mississippi river, Maj. Bliss reports that, from an examination of the sentinels who had been on post during the night of the 12th and 13th of November, he could not learn that any recurrence of the meteoric phenomenon of 1833 had been observed. He gives a particular account of a very bright meteor seen at 5 o'clock, A. M. on the morning of the 9th of January, 1835.

Lieut. Col. Davenport, commanding at Fort Armstrong, Rock Island, Upper Mississippi river, Illinois, states, as the result of information which is satisfactory to him, that no meteoric phenomenon was observed on the 13th of November, 1834, at his post. He gives the temperature at 7 o'clock, A. M. on the 13th of November, as 42° Fah., the wind N. E., and the weather fair.

The reports from Fort Dearborn, Chicago, Illinois, commanded by Maj. Green, and from Fort Winnebago, portage between the Fox and Ouisconsin rivers, N. W. Territory, commanded by Lieut. Col. Cutler, state that no unusual meteoric display was noticed there on the night referred to.

The return from Fort Howard, Menomoniveille, Michigan Territory, is of the same purport, General Brooke adding, that there were several apparent shocks of an earthquake in November, 1834, as evidenced "by a severe rocking of the flag-staff in the night, although it was perfectly calm at the time."

From Fort Mackinac, Straits of Michilimackinac, Michigan Territory, Capt. Clitz reports that he has "made inquiry of the sentinels who were on post on the night of the 13th of November last, and *one* only, an intelligent young man, who was posted at the north angle of the fort, saw a shower of meteors in the north, between 12 and 1 o'clock, the duration of which, as near as he can recollect, was about one hour."

Maj. Hoffman reports from Fort Gratiot, on the St. Clair river, that no recurrence of the meteoric phenomenon of 1833 was observed at his post.

The returns just given are from eleven posts in the Atlantic States, from Maine to East Florida; from six posts in the Western States, or frontier, and from five on the northern frontier; they agree in statin

with one exception, that no unusual meteoric display was noticed on the night of the 12th, 13th of November, 1834.

It is almost needless to observe, that the military stations are places where observation of any striking meteoric phenomenon may be expected, at least one sentinel being on post, the reliefs being posted by a non-commissioned officer, and the sentinels visited at least once during the night by a commissioned officer. Vigilance is particularly to be expected in our out-posts, from which the reports are quite minute. A local "shower" of meteors was observed by a sentinel at Fort Mackinac, about midnight, and lasting about one hour. Many of the reports do not confine themselves to a statement that no meteoric display was witnessed at the posts, but include inquiries made in the vicinity.

These reports may, I think, be considered conclusive against the occurrence of any extensive and remarkable display of meteors, so far as ordinary observation could have detected such a display.

In reply to letters addressed to friends in different quarters, with a view to ascertain if special observation had been made on the morning of the 13th of November, I received the following information.

At New York, as I learned from Prof. Renwick, a gentleman well known for his scientific attainments, assisted by a friend, watched during the whole night, but saw no remarkable occurrence of meteors. Doctor Gibbons, of Wilmington, Delaware, observed the heavens, in connexion with his observations on the aurora, until about half-past 12 o'clock on the morning of the 13th of November. He informs me that he has been in the habit of inspecting the heavens, frequently, every clear evening since November, 1833, and has observed, often, an unusual number of meteors, for several evenings in succession, and sometimes the reverse of this. The night of the 12th, 13th of November, 1834, was clear.

No unusual occurrence of meteors was noticed at Baltimore by the city watch, or others, to whom inquiry was directed by Prof. Ducatell; nor at the University of Virginia; nor at the University of North Carolina; at which places, as I learn from Prof. Patterson, and Prof. E. Mitchell, no special observations were made. At Cincinnati, Ohio, the night was cloudy, with showers.

President Lindsley, of Nashville University, informs me that one of the gentlemen at the University was on the look-out on the night of the 12th, 13th, but saw nothing remarkable.

The direct observations made at New York, Philadelphia, and Nashville, show that no unusual meteoric display occurred at either of these places; and the general experience at Baltimore, and Wilmington, Delaware, the University of Virginia, and the University of North Carolina, was to the same purport. As far as public testimony through the journals can reach this point, it confirms these conclusions.

I infer that the meteors seen at New Haven, from one o'clock until daylight, by Prof. Olmsted, and the gentlemen who assisted him; at West Point, after 2, A. M. by Mr. Twining; at Mackinac, between twelve and one o'clock, by the sentinel, were not parts of one me-

teoric display, visible over an extensive region of country, like the phenomenon of November, 1833, but were local.

It is to be seen from the foregoing statements, that the weather was not the same over the extent of country which they embrace, while on the 13th of November, 1833, there was a most remarkable uniformity over a much greater surface.

*Philadelphia, May 28th,* 1835.

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## FRANKLIN INSTITUTE.

### *Quarterly Meeting.*

The forty-sixth quarterly meeting of the Institute was held at their Hall, July 16th, 1835.

Thomas Fletcher, Vice President, in the Chair;

Charles B. Trego, Rec. Sec., P. T.

The minutes of the last quarterly, and also of the special, meeting were read and approved.

Donations of books were received from Messrs. Richard Ronaldson, Edward H. Gill, Carlos Shepard, Samuel V. Merrick, William P. Ferrand, James Harper, and A. L. Elwyn, M. D., of Philadelphia; also from Major D. B. Douglass, and T. B. Wakeman, Esq., of New York; Edwin Ruffin, Esq., of Shellbanks, Virginia; and from the clerk of the House of Representatives, Washington city, D. C.

Mr. Thomas S. Richards, of Philadelphia, presented specimens of iron ores.

The actuary laid on the table the various periodicals received in exchange for the Journal of the Institute, during the past quarter.

The forty-sixth quarterly report of the Board of Managers was read and accepted, and referred for publication.

The Treasurer presented his quarterly statement of the funds of the Institute, which was read and accepted.

Mr. J. M'Intire offered the following resolution, which was, on motion, referred to the consideration of the Standing Committee on Instruction, appointed by the Board of Managers.

*Resolved,* That a course of lectures on Architecture, delivered before this society, is indispensable, as well to accomplish the ends, as to promote the prosperity, of the Franklin Institute; and that it is hereby warmly recommended to the Board of Managers, to secure the delivery of such a course next winter.

(Extract from the minutes.)

Thomas Fletcher, *Vice President.*

Charles B. Trego, *Rec. Sec. P. T.*

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### *Forty-sixth Quarterly Report of the Board of Managers of the Franklin Institute.*

The Board of Managers respectfully submit to the Institute, their forty-sixth quarterly report.

The present quarter embraces but few of the active operations of the institution; those which have been acted upon, it is, in pursuance

of the trust confided to them, the duty of the Board to present to the Society.

During the present season, the schools and lectures connected with the Institute not being in operation, the Committee on Instruction are actively engaged in devising and maturing measures for conducting them during the ensuing season, in such a manner as will tend to increase their present utility, and add to their high and merited reputation.

The Library is gradually increasing; a number of valuable works have been added during the last quarter; and the Board respectfully ask and request the attention and interest of the members to promote this, which they deem one of the most interesting and valuable objects of the Institution.

Additions have been made, during the last quarter, to the Cabinet of Models, and the committee who have charge of the Minerals belonging to the Institute, are progressing in the classification of them, the completion of which the Board confidently expect very soon to have the pleasure of announcing to the Society.

The Committee on Premiums and Exhibitions have been, for a long time, diligently and zealously engaged in their preparations for the exhibition to be held in October next; a large and efficient committee of arrangement, of members of the Institute, has been appointed, from whose prompt, punctual, and vigorous exertions, the Board confidently expect the most beneficial results. The premium list has been printed, and extensively circulated. Although this subject has been frequently alluded to, still the Board consider it their duty to impress upon the members the great necessity of an interest being taken by them in the exhibitions, inasmuch as they are of vital importance to the interests of the institution, and eminently calculated to promote and elevate the character of the mechanics, and the mechanic arts, throughout the United States.

During the past quarter, the Committee on Science and the Arts have been engaged, as usual, in the examinations of subjects brought before them by inventors. Eleven inventions and improvements were submitted, two of which have been recommended to the Board of Managers for the Scott's legacy premium, viz: for a knitting machine, invented by Messrs. M'Mullen & Hollon, of Pennsylvania, and an improved stand for reflecting telescopes, by Amasa Holcomb, of Massachusetts, which the Board have approved, and accordingly awarded.

By a resolution of the Society, passed on the 20th of June, 1835, the Board of Managers were authorized to sell the Hall of the Institute, and purchase the property owned by the Grand Lodge of the State of Pennsylvania, in Chesnut street. The necessary measures were immediately taken by the Board to carry into effect the instructions of the Society, and the report of the committee to whom the subject has been entrusted, will be communicated to the Society as soon as the object of their appointment has been effected. The ample accommodation which this eligible location affords for the operations of the Society, will be calculated to attract public attention, and give

a new impetus to the exertions of the members, which cannot fail to be attended with the most beneficial results.

The Board have great pleasure in announcing to the Society, that the list of subscribers to the Journal is rapidly increasing, and that its prospects are improving.

The monthly meetings of the institution have been well attended, and the interest in them appears to be unabated. In conformity with former usage, the Board recommend that the meetings in July and August be suspended by a resolution of the Society.

The reading room still continues to enjoy the countenance and support of the members, which the Board indulge the hope may long continue.

By the quarterly report of the treasurer, the Society will be gratified to perceive that the finances of the Institution are in a flourishing condition.

All which is submitted by order of the Board.

GEORGE FOX, *Chairman.*

WILLIAM HAMILTON, *Actuary.*

*July* 15, 1835.

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COMMITTEE ON SCIENCE AND THE ARTS.

*Report on Mr. William Burk's Plan for Propelling Canal Boats.*

The Committee on Science and the Arts, constituted by the Franklin Institute of the State of Pennsylvania for the promotion of the Mechanic Arts, to whom was referred for examination, a Plan for propelling Canal Boats, invented by Mr. William Burk, of White Marsh, Montgomery county, Pennsylvania, REPORT:—

That they have examined Mr. Burk's model, and find his plan to consist in the use of a spiral wheel, in the usual form, placed directly ahead of the boat, which wheel is to be put in motion by horse power, by means of an endless platform, placed lengthwise of the boat, which revolves on, and carries a horizontal wheel at each end, the forward one of which being connected by suitable wheelwork to the water wheel at the bow of the boat. This platform is a little inclined in the direction of the horse's head, the object of which is supposed to be, to obtain power by the weight of the horse as well as by his draught; in all of which the committee has discovered no novelty, unless, indeed, the application of the spiral wheel, (an old and frequently tried contrivance in almost every other mode,) at the bow of the boat, should prove to be a new place for its action, which, whether new or old, cannot be so advantageous as its present usual application at the stern of the boat, since the water which will be put in motion by Mr. Burk's wheel, will impinge on the bows of the boat, thus impeding her progress. The committee make a passing remark, that no advantage is perceived by it to arise from the inclination of the platform on which the horse is to work.

By order of the committee.

WILLIAM HAMILTON, *Actuary.*

*April 29th*, 1835.

## *Report on Mr. Henry Rulon's Windmill.*

**The Committee on Science and the Arts, constituted by the Franklin Institute of the State of Pennsylvania for the promotion of the Mechanic Arts, to whom was referred for examination, the model of a Windmill, invented by Mr. Henry Rulon, of Bridgeton, New Jersey, REPORT:—**

That they have carefully examined the model of the proposed mill, which was presented by Mr. Rulon without any explanation of its principles, or supposed advantages over other horizontal windmills now in common use.

It consists of a building of an octagonal form, the upper part of which is occupied with the sails, and the frame-work by which they are connected with a vertical shaft, and is enclosed by shutters, hung by cords and pulleys, in the usual way of hanging windows; the lower part of the building, which contains the mill-work, is enclosed by weather boarding, outside of which the shutters are made to slide downwards, which opens the upper portion of the building for the free admission of the wind to the sails. In the centre of the building, a vertical shaft extends from its base to the upper part of the permanent enclosure, at which point eight horizontal arms are firmly connected to the end of the shaft; these arms extend to about one-third the radii of the building, and some distance below them there is another shaft, corresponding in number and dimensions, and parallel therewith, forming together two separate sets. Vertical timbers are framed to the ends of each of these arms, each timber being connected with the corresponding arms of the upper and lower set, and extends upwards to near the height of the base of the roof, where they are connected in pairs with the ends of each one of four horizontal timbers, the latter crossing each other at the centre, parallel with the arms on the shaft; these horizontal timbers are secured to each other at the centre, where a vertical timber is attached, which turns in a box, secured to timbers thrown across the centre of the building for that purpose, thus forming an axis, by which the sails are to communicate motion to the mill, by means of four horizontal timbers, each equal in length to the interior diameter of the building, and each one of which forms arms for one pair of sails; these timbers are supported by each pair of the vertical timbers of the axis, on boxes, which admit of their turning freely, at spaces above each other equal to the width of each scale, thus forming one horizontal axis for each pair of sails, which, by turning freely, adapts itself to any required position of the same.

Each pair of sails are firmly attached to the arms of their peculiar axis, with their planes crossing each other at right angles, and extending nearly their whole width from one side of their respective arms, and in length from the ends of the arms to the upright timbers of the vertical shaft; the weight of these sails, (which are of wood,) when not acted on by the wind, will cause them to take positions, forming angles of 45° with the horizon; but, when receiving the full force of the wind, they will turn so as to expose one sail to its action,

whilst the other, standing in the plane of the horizon, will not feel its influence. The sails are maintained in the latter position by means of a weight, to which is attached two cords, which are also attached to a pulley on the axis of the sails, at such radial points of the pulley as correspond with the sails respectively.

When the sails rest in their natural positions, that is, when not acted upon by the wind, the weight rests on a support below, and its connecting cords hang slack from the pulley, and are of such length, that either becomes tight when the sail having a radial correspondence with their respective attachments to the pulley, takes a horizontal position, the acting sail being then perpendicular. When the force of the wind becomes so strong as to lift the weight, the positions of the sails will be so altered as to reduce the plane exposed to the wind of the *acting* sail, whilst the other is made to oppose its action; hence, with every degree of force in excess, the position of the sails will be altered, whilst the nett propelling force will remain the same, and is exclusively dependent on the magnitude of the weight.

The only important novelty which the committee perceive in the arrangement of this mill, is the application of weights to regulate the position of the sails on *vibrating horizontal* arms, as such weights are in common use to effect a similar object in mills where perpendicular sails, revolving horizontally, are used. A model of a mill was presented to the Franklin Institute, in the year 1827, by M. Biard, of Paris, which he denominated the Anemotope; for a report on which, see the Franklin Journal, vol. iv., page 125, (1827.) The proposed action of this model is almost identical with Mr. Rulon's, wanting, however, the proper arrangement in hanging the *vibrating* axis of the sails, to admit the useful action of regulating weights, as used by Mr. Rulon; consequently, such means of regulation were not contemplated by M. Biard; hence, to Mr. Rulon's plan must be conceded a decided preference to that of M. Biard; but whether it will prove more useful than other modifications of horizontal windmills *now in use*, cannot be ascertained with certainty without practical trial on a large scale, of which the committee deem it very worthy.

By order of the committee.

WILLIAM HAMILTON, *Actuary.*

*June 11th*, 1835.

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## AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN FEBRUARY, 1835.

*With Remarks and Exemplifications, by the Editor.*

1. For an improvement in the *Machine for Cutting Straw;* patented October 3, 1834; Stephen Ustick, city of Philadelphia, February 5.

We noticed this machine, as originally patented, at p. 313 of the last volume; the claim to improvement consists in "the sliding bottom,

denominated the lower feeder, and the general construction of the feeding apparatus, as described." The description, however, is by no means clear, although given at considerable length, and with a manifest intention to make it so. Perhaps we might be able to trace out its whole meaning, could we spare time enough for the purpose; but, even then, we could not transfer it to our pages without a drawing.

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2. For a *Machine for Sawing Staves,* and other cylindrical work; Hart Pepper, Southwick, Hampden county, Massachusetts, February 5.

This machine consists of a mandrel, mounted in the manner of a collar and mandrel lathe, and carrying a saw, which is represented as barrel shaped, and which must, of necessity, be of the dimensions of the vessels which the staves are intended to form; the saw, we are told, may be made of wrought iron, with cast steel teeth inserted in the cutting edge. The stuff is to be fixed upon a suitable carriage, furnished with guides of the proper form, to bring it up against the saw.

There is not any claim made, nor are there any directions given more definite than those above indicated. Saws very similar to the foregoing have been long in use, but it would be a formidable task to make one, the body of which should be sufficiently true, whilst its dimensions were equal to that of a pipe, or hogshead.

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3. For a *Reciprocating Fur Cutting Machine;* Curtis Miranda Lampson, of the city of New York, but residing in London at the time of his application; February 6.

The machine which is the subject of this patent has considerable complexity, and the description refers throughout to the drawings, which represent a machine confessedly old in most of its parts, but described and shown for the purpose of clearly exhibiting the parts claimed as improvements, which consist in the manner of applying a blade, or scraper, and of a spring which acts upon it.

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4. For a *Thrashing Machine;* Joseph Ross, Boundbrook, Somerset county, New Jersey, February 6.

(See specification.)

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5. For a machine for *Hulling Clover;* Joseph Ross, Boundbrook, Somerset county, New Jersey, February 6.

(See specification.)

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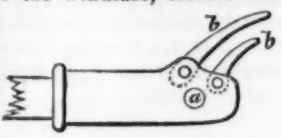
6. For an improvement in the *Windlass for Ships;* Seth Adams, city of Boston, Massachusetts, February 6.

The novelty claimed in this windlass, is the forcing it round by means of a handspike, or lever, so attached by gearing as that a similar effect shall be produced by either raising or depressing the lever.

A ratchet wheel is fixed on one end of the windlass, close to the cheek, or knight head, and a lever turning on a fulcrum, *a*, is attached to the head in such a way as to allow the palls, *b b*, to take into the teeth of the ratchet wheel, and as these work upon pins on opposite sides of the fulcrum, the desired effect is produced. The following are the words of the claim.




"I claim the arrangement of the lever and palls in the gear of the windlass, viz: putting a pall on both sides of the fulcrum; the object is, that the windlass may be put in motion both by the upward and downward movement of the lever, by which means one-half of the time required with the gear in use, is saved."

We are not aware that double palls of this description have been previously applied to ships' windlasses, although they are by no means uncommon in other machinery.

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7. For a *Cheese Press;* Rufus Porter, Belerica, Middlesex county, Massachusetts, February 6.

(See specification.)

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8. For a *Washing Machine;* Amos C. Haniford, Northfield, Merrimack county, New Hampshire, February 6.

Here is a box, or trough, within which two "feet" are to traverse backward and forward by means of a double crank shaft at one end thereof. These *feet*, so called, have cheeks, or sides, nearly triangular, and rollers extend across from one cheek to the other, excepting on that side of the triangle which slides against the bottom of the trough; at each end of the latter there is also a semi-circular row of rollers, between which and the *feet*, the clothes are to be squeezed. The cranks stand in opposite directions, and, by means of the shaft which connects them with the *feet*, one of them is worked forward, whilst the other is moved backward.

"I do not claim as my invention, any of the parts of this machine taken separately; nor do I claim the performing of the operation of washing simultaneously, this having been before effected; but what I do claim, is the general construction and arrangement of the washing parts, consisting of the two feet, and the two half circles, constructed in the manner, and operating upon the principle, hereinbefore set forth; without regard, however, to any particular dimensions or materials, or the precise form given to the respective parts."

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9. For an *Auger, or Bit;* Ezra L'Hommedieu, Saybrook, Middlesex county, Connecticut, February 11.

This patent is taken for various modes of forming the cutting edge of the twist auger; seven varieties, or modes, of forming it are described in the specification, and represented in the drawings; some of these very closely resemble such as we have already seen in use, but as the patentee is thoroughly experienced in this matter, having long been an inventor and manufacturer of such articles, we presume

that the augers and bits themselves would exhibit differences sufficiently characteristic, although they may not be very readily represented in the drawing and description. A detail of them in words would afford but little light respecting them, and would excite but little interest.

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10. For an improvement in the *Theodolite, or Surveyor's Compass;* James Eames, Newry, Oxford county, Maine, February 11.

The patentee says that, in the first place, he takes "the circumferentor, without the usual index, and forms the outside of the box so as to preserve one side straight, parallel with the north and south line under the needle in the card."

Secondly, he takes "the protractor, adding two lines, one to show the swag of the chain, the other the rise and fall of the uneven lands, attaching it to the straight side of the compass, so as to hang perpendicular."

Thirdly, he takes "the tube, or index, with prospect glasses inside of said tube, and attaches it to the compass on the outside of the protractor, in such a manner as to move round like the index of the theodolite, when placed for taking heights, &c." When the compass has been placed and leveled, the tube may be raised so as to descry the object, when, by casting the eye upon the protractor, where the first end of the tube intersects the lines thereon, the degrees, the swag of the chain, and the rise of land for a certain distance, are perceived. In descending ground, by lowering the tube, taking the object, and casting the eye upon the protractor, directly under the further end of the tube, where it intersects the lines of the protractor, the swag of the chain, and the descent of the ground, are seen. The claim is to "the above described machine, in bringing the several instruments together in my new invented way, as before described."

We have thus given a full view of the foregoing improvement, and nearly in the words of the patentee, thereby enabling those who are acquainted with the use, and the various modifications, of the theodolite, or surveyor's compass, to judge of the extent of novelty and utility in the foregoing arrangement.

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11. For an improved *Horse Rake;* Noah Briggs, New Hartford, Oneida county, New York, February 11.

(See specification.)

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12. For a *Machine for Shelling Corn;* Jonathan H. Taylor, and Aaron J. Cowley, Westfield, Chautauque county, New York, February 11.

This machine differs considerably from all those for the same purpose which we have had occasion to examine, but a full description of it would require more time and space than we are, at the present moment, disposed to afford. A cast-iron wheel, fifteen inches in diameter, is made to revolve, vertically, by means of a winch; this

wheel has spurs, or points, on each side, to aid in shelling the corn, and on its edge there are teeth, which give motion to a wheel, or pinion, on a second shaft; this second shaft carries two cast-iron wheels, one foot in diameter, embracing the main wheel, first described, between them; each of these wheels has a wide rim cast on it, which inclines inwards towards the main wheel, reducing the interior diameter to ten inches; upon these rims there are cross teeth, upon which the ears of corn are fed, being made to run down two inclined troughs, or hoppers, when, by the combined motion of the main and secondary wheels, the ears are made to revolve, and the grain is shelled off.

So far as the drawing and description enable us to judge of the operation of this machine, we are disposed to form a very favourable opinion of it; we think that it is ingeniously contrived, and has sufficient originality.

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13. For an improvement in the *Art or Mode of Ploughing;* David Ghormley, Ware, Fayette county, Ohio, February 13.

This patent is for ploughing with a double shovel plough, so made that one shovel may act on each side of a row of corn. Two oxen, or horses, are to be employed, by which it is said that one man will be able to do the work of two. The shovels, or shears, are fixed upon separate timbers, allowing the corn, &c. to pass between them. There is a drawing given of the plough, but, according to the terms used in the specification, this is not patented, the novelty, if any, being in "the *art* or *mode* of ploughing," and not in the instrument.

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14. For an *Apparatus for Scalding Hogs;* Thomas J. Godman, city of Baltimore, February 13.

A tub to contain water, and sufficiently large to allow of the hog to be scalded being immersed in it, is sunk into the ground, so as to stand at a convenient height above it. A boiler, such as is used for generating steam, is fixed in any suitable manner, and a tube from the top of this boiler leads to the bottom of the tub, for the purpose of conducting steam into the water. A second tub, or reservoir for cold water, is placed in some convenient and elevated situation, between the scalding tub and the boiler. From this tub, which is to be kept filled with water, a tube leads into the boiler, to supply its waste, and into the scalding tub, to keep it sufficiently full, and also to regulate the temperature. Each of the tubes is furnished with a stop cock.

The claim is to "the introduction of a steam and a water pipe into the scalding tub, used in connexion with an ordinary boiler for generating steam, for the purpose, and in the manner, herein set forth and described."

The heating of water in boilers and vats, by means of steam, and the supplying of such boilers and vats with water by tubes and cocks, and also the supplying of water to a boiler in the same way, are processes so well known, that we should much doubt the validity of a

patent standing on the basis of that before us. Were there any thing new, and special, in the arrangement, the case would be different; but this we do not find, either in the description, or the claim.

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15. For a combined *Cooking Furnace and Bake-oven;* Charles E. Russell, city of Philadelphia, February 13.

The fireplace of this apparatus consists of a round stove, or furnace, made in the usual manner. Around this are to be placed boilers, which may also be cylindrical, excepting on the side that is to be in contact with the stove, which is made concave, so as to fit it; two or three of these boilers may stand on a lap, surrounding the lower part of the stove. An oven surmounts the stove, which may be quadrangular, and have an arched top; it is furnished with a circular rim that fits on to the top of the stove, and a flat flue runs up at the back of it, conducting the heated air into a space formed by making the top of the oven double. A partition divides this space into two parts, and the hot air having an exit opening at each end of the hollow top, escapes in both directions. The boilers are provided with tubes, the closed ends of which pass into the fire, through openings in the stove.

The claim is, to "the general arrangement and combination of these parts, so as to form an instrument substantially the same with that described; various minor alterations may be made, whilst the general principle remains unchanged."

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16. For a *Plough;* Nathan Robinson, Sackett's Harbor, Jefferson county, New York, February 13.

(See specification.)

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17. For a *Revolving Brad Cutting Machine;* Asa B. Woods, and Ebenezer Talbot, Jr., Windsor, Hartford county, Connecticut, February 13.

The different parts of this machine are very well represented and described, but the points claimed are, principally, independent of the instrument itself, as will presently appear. The cutter wheel is to be of iron, about a foot in diameter, and is to revolve on a stout, horizontal shaft. On opposite points of the periphery of this wheel, are to be placed cutters, which consist of steel let into grooves, and regulated by screws. A bed piece, making part of a stout cast-iron frame, is to support the fixed or stationary cutter. Upon the same shaft with the cutter wheel, there is a cam wheel, intended to vibrate the strip of metal to be cut, there being a connexion from it for that purpose. In front of the cutting frame there are feeding rollers, to cause the strip to advance with the proper speed.

The claims made are as follows: "First. The application of a furnace, or fire, in any way, to brad cutting machines, to heat the plate as it passes into the machine to be cut."

"Secondly. The joining of the plates to be cut into brads, so that the machine can operate for a longer time, and also to save the remnants usually made in working short plates.

"Thirdly. The general arrangement of the various parts of the machine, as set forth in the above specification, applied to a revolving brad cutter."

It may seem passing strange, but it is nevertheless true, that, although the apparatus generally is very fully described, we do not find any mention of "the application of a furnace," except being told that a furnace is to be supported between the two frames, in a line with the grooves below them. And the same is the fact as regards the second item, there not being a word concerning "the joining of the plates," although we are told that "beyond the feeding rollers, a windlass, or reel, is to be secured, near the bottom of the frame." What is claimed, therefore, is not described, and what is described, is not claimed. The latter we think it was best to omit, and are convinced that untenable ground has been taken in presenting as new, "the general arrangement of the various parts," as revolving cutting machines, very similar in construction, have been repeatedly essayed.

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18. For a *Cotton Planting Machine;* Michael Beam, Buffaloe, Lincoln county, North Carolina, February 13.

This machine has a general resemblance to several others employed for planting seeds, but differs from them in some of its particular arrangements. It is to be drawn along in the manner of a cart; the seed is to be placed in a barrel, which is made to revolve by the wheels on either side, holes being made in the barrel to drop the seeds in the right quantity, and these are conducted down a trough into a furrow made by a coulter on the front bar of the frame. Scrapers for covering the seeds are placed in the rear, and are made capable of adjustment, so that, if required, they may form a ridge of earth over the seed. The particular parts claimed we shall not specify, as some of them would not be well understood without the drawing.

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19. For a *Corn Sheller;* Adna L. Norcross, and Ephraim Rand, Hallowell, Kennebec county, Maine, February 13.

Excepting in trifling points, relating to matters of arrangement merely, this machine is exactly like the first patented corn shelling machine, the patent for which expired many years ago. A cylinder set with teeth, is to have a concave borne up against it by springs, to adapt it to ears of different sizes. A claim is made to the guard, springs, and apron; to the manner in which the teeth are set, and to the general form and arrangement of the whole. It is no easy task to tell what is meant by some of the parts above named, as the drawing is altogether unworthy of the name.

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20. For an improvement in *Backs for Blacksmiths' Forges;* Isaac Sawyer, Hallowell, Kennebec county, Maine, February 13.

About two or three years ago, several patents were granted for forge backs of cast-iron, which backs were hollow boxes, into which the wind was to be blown, whence it was to proceed through a tuyere, or opening, into the fire. The one now patented differs but little from some of those alluded to, excepting in the material used in making some part of it; the front plate, or that with which the fire is in contact, and the conductor through which the wind passes, are to be of a mixed metal, consisting of copper, zinc, lead, and tin, in the proportion of eight pounds of copper, one pound of zinc, half a pound of lead, and two ounces of tin, or of any other similar composition in which copper is the main ingredient. The claim is to the making the parts named of the foregoing composition, and the forming of the box in separate parts. The latter has been before done, and the plan is patented; the former is of more than doubtful utility, as it will rob the fire of a larger portion of its heat than a back of cast-iron, being a better conductor; and it will, when heated, be much more brittle than iron.

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21. For a *Brick Striker;* Peleg Sweet, Ashtabula, county of Ashtabula, Ohio, February 20.

The drawing, which is referred to through the whole description of this machine, is so imperfect, as to afford a very inadequate idea of its construction and mode of operation, and we shall not attempt to decypher it. The claim is, "exclusively the discovery of properly confining and supplying the mortar, properly placing the moulds, and forcing the mortar into the moulds by the immediate action of the propeller, so as to leave no brick imperfect. The operation of the machine is rapid, sure to produce perfect bricks, and is the best labour saving machine for the purpose within his knowledge."

This claim is altogether defective, as it refers to the thing done, instead of to the means, or machinery, by which it is effected.

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22. For an improvement in the *Machinery for Manufacturing Paper;* John Ames, Springfield, Hampden county, Massachusetts, February 20.

This patent is taken for the manner of applying a drying cylinder to machines for manufacturing paper. Those acquainted with these machines, know that the paper, after passing through the press rollers, is subjected to the action of large hollow cylinders, by passing over which it is effectually dried, these cylinders being heated by steam, or hot air, which passes into them through a hollow gudgeon. The patentee substitutes the drying cylinder for the upper press roller; these cylinders are, in preference, made of cast-iron, and from nine to twelve feet in diameter; the lower press roller is to be borne up against the cylinder by means of weighted levers, with such force as to cause the drying cylinder to revolve.

The claim is, to "the use and application of the said cylinder, as a substitute for said upper and main press roller, in the machines which have heretofore been in use for making paper, and in the con-

nexion and combination with the said lower press roller, or rollers, in the manner, and for the use and purposes, aforesaid."

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23. For the *Application of Hydraulic or American Cement, to the Construction of Tanning Vats, &c.;* John C. Johnston, Cattskill, Greene county, New York, February 20.

This patent is taken for "an improvement in the application of hydraulic, or American, cement to the construction of tanning vats and leaches; malsters' and brewers' vats, or reservoirs; reservoirs and vats necessary to distillers; also, vats and reservoirs for manufacturers of sugar and molasses; also, for the application of hydraulic, or American, cement to the manufacture of circular and square brick, or blocks, of the above mentioned cement, of any required size, or form, for all the various uses of building or architecture; also, for the application of the above cement to the forming of brick, or blocks, open or solid, fluted and plain, for the construction of columns, or pilasters; also, for the application of the above cement to the moulding, or forming, of arches for doors and windows; also, for forming window sills, or lintels; also, for forming door sills."

About the preparation of the cement, no information whatever is communicated, but we are left at perfect liberty to apply to what quarry we please for water lime, and to mix it according to our own knowledge or ignorance upon the subject. The directions for forming the blocks, and those for building with them, are altogether meagre, and the claims made are "only the application of the cement to the manufacture of the brick, or sections, to be used in the construction of the cistern, or other circular work; and the manufacture of the brick, or block, for the purposes of architecture." How many claimants there are to this discovery, we know not; but this we know, that the same thing has been long in use, and that columns, and plain and ornamental blocks, for architectural purposes, statues, and a countless number of other things to which it is applicable, are daily made of cement in England; it has also been employed in this country; the arms and other ornaments in front of the Arcade, in Philadelphia, were made of cement, by Mr. Gevelot; he, however, used *English* cement, as the American was not then well prepared. How long it is since artificial stones were made, we are unable to say, but it has been contended that the pyramids of Egypt are of this character; without, however, subscribing to this opinion, and dating the invention back to the period when old Time himself was a stripling, enough has been said to show that artificial stones made of cement are not things of yesterday.

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24. For a *Rotary Steam Engine;* George M. Alsop, city of Philadelphia, February 20.

The patentee claims "in this engine, the peculiar arrangement and construction, taken as a whole, and not its several parts taken individually, except the arrangement and construction of the piston cylinder, so as to adapt it to any wear that may take place; and also

the arrangement of the valve cylinder and shifting stops, or slides." The application of an engine, similarly coustructed, as a water power engine, is also claimed.

The variations of this engine from some others of the rotary kind, manifest considerable ingenuity, but still leave the general principle of action the same with certain of its predecessors, offering nothing which appears to us likely to obviate the objections which have prevented their continued use.

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25. For a *Composition for rendering Roofs Water-proof, &c.;* Lyman Garfield, Troy, Rensselaer county, New York, February 20.

The composition spoken of is to be used "for the purpose of making the roofs of buildings water-proof; for lining floors, walls, aqueducts, and vessels for holding or passing water, and for cementing the parts of vessels; also for making door and window caps, and sills, where free-stone is now used; also to any wood-work, to prevent leaks, and the lining of baths, sinks, and water spouts; and for making stoves, fireplaces, furnaces, jambs, and mantel pieces; by uniting sand, water lime, ashes, the earths, or alkalies, clay, oil, and copal varnish, with or without dissolved India rubber, or caoutchouc."

The foregoing quotation is from the petition, and refers to so many things, that we were led to anticipate, in the specification, a voluminous description of the processes necessary to carry the whole into operation; this, however, we have found to be vague and indefinite, as will appear from the epitome which we are about to furnish.

To make roofs water-proof, we are directed to "dissolve caoutchouc in spirits of turpentine, or seneca oil, and then evaporate the turpentine, or seneca oil, by alcohol, so as to form a paste," which is to be spread upon the roof by any suitable instrument; sand, water lime, and coal ashes, in equal parts, are then to be sifted over it, (or sand, ashes, and earth, may be used,) and pressed down; or the whole materials are to be mixed to the consistence of mortar, and spread by means of a trowel. Parts of buildings, or vessels, decks and awnings, whether of wood or cloth, are to be treated in the same way.

To the dissolved India rubber may be added, "any of the earths, or alkalies, whether silicious or otherwise, or anthracite coal ashes, or wood ashes, or water lime, or the combination of any or all of these." Or the following composition is to be used for the same purpose: "equal parts of sand and ashes, anthracite coal ashes being preferred; mix with oil and copal varnish, about one-fourth copal varnish, or some other varnish, of a hardening quality. The sand and ashes must be mixed soft enough to enable the operator to spread it upon the roof with a trowel."

Water lime, sand, and anthracite coal ashes, are to be employed for making window and door caps, sills, sinks, pipes, &c.; sand, or gravel, or sand and coal ashes, from one to ten parts, to one part of

water lime. For resisting fire, a small portion of pipe, or other, clay may be added.

The patentee has not made any claim, or told us in what the novelty of his plan consists; nor, from the tenor of his remarks, should we suppose that he has made any adequate trials of his own prescriptions, if such they may be called, when given in terms so loose and indefinite. His first composition has a basis of India rubber, whilst in his other, this substance is not used at all; his patent, therefore, is for things entirely dissimilar, and distinct from each other, and these, if valuable, ought, therefore, to have been made the subjects of separate patents.

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26. For an *Air Pump for Extracting Foul Air from Ships, &c.;* James Barron, United States Navy, city of Philadelphia, February 20.

In the number of this journal for June, 1828, we published some extracts from, and remarks on, a pamphlet from the pen of Commodore Barron, "On the Causes of Dry Rot," which contained a description of the bellows used by him for ventilating the holds of ships, and which were constructed like the common smiths' bellows, having a tube leading from the valve hole on the lower board, into the hold of the vessel. However good the thing may be, and we have no doubt of its utility, it is public property, not being new to the public. This is a principle which was fully settled in the case of Sellers & Pennock *v.* Dialogue, see vol. iii., p. 184. "The true construction of the act is, that the first inventor cannot acquire a good title to a patent, if he suffers the thing invented to go into public use before he makes application for a patent."

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27. For an improvement in the *Percussion Gun Lock;* Robert Beale, city of Washington, District of Columbia, February 20.

This percussion lock is intended for fowling pieces, &c., and the things claimed as improvements are, "the form and simplicity of the lock, it having but one spring in the plate; but what I principally claim, is my movable percussion key, or hammer, which, when the gun is not in immediate use, may be in an instant removed, and rendered perfectly harmless." A proper description of the proposed arrangements would require the drawing.

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28. For an improved mode of constructing a *Mill Bush, or Spindle Box, and a Ring and Ball for the Stones of Flour Mills;* Warren P. Wing, Greenwich, Hampstead county, Massachusetts, February 20.

(See specification.)

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29. For a *Plough;* Benjamin Johnson, Hickory Grove, Bond county, Illinois, February 20.

There are three things mentioned as improvements on the common

Carey, or Bull, plough; two of them refer to the manner of forming the wood work of the plough, and the attaching the parts together; the third relates to the construction of the mould board, which is to be formed into three parallel ribs, behind the wing, which ribs may be from one to two and a half inches wide, and have spaces of corresponding width between them. The advantages of this improvement are said to be, "that the draft is rendered much lighter in consequence of there being less friction, the spaces between the ribs preventing that clogging, and accumulation of earth and soil, common to the mould board; and that all or any part of the ribs can be taken off at pleasure, and a heavy plough made light, according to the work to be performed."

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33. For a *Percussion Lock;* Thomas Daplyn, Dover, Wayne county, Ohio, February 20.

The lock here patented is so constructed, that it can be removed instantaneously from the stock. For this purpose, all its acting parts are contained within a thin case, which drops into a mortise made through the stock, the hammer projecting above, and the trigger below, the case. By pressing the thumb upon a catch, the lock is released, and may be carried in the pocket; when wanted for use, it is merely dropped into the mortise. The lock appears to be well constructed, its parts being so arranged as to adapt it to the form given to it, without interfering with its operation. The claims are to "the manner of inserting the lock in the stock," and to "the manner of construction, or the mode of putting the lock together, in all its parts."

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31. For *Scoop Shovels, and Machinery for manufacturing them;* John and William Smith, Williamstown, Berkshire county, Massachusetts, February 25.

The claims made "as original, is a sheet iron scoop shovel, with a circular or spherical end, moulded into form without cutting the sides. Also the rotary shears, in their adaptation to general purposes. Also the application of the principle of a falling die to the specific purpose of forming shovels."

The particular form given to the shovels is described in the specification, but is not represented in the drawing, and as we have not seen it, we venture to hope that there is more novelty in this, than in the "machinery for manufacturing the same," which consists of the common revolving shears, or cutters, for cutting the metal, and the common drop-press, furnished with dies to give it the intended form.

The claim to the application of these well known instruments to the making of shovels, is about as rational as it is valid, and as novel as would be the claim of the *application* of a cast-iron hammer to the cracking of hickory nuts.

32. For an improvement in the mode of *Using Chains, or Ropes, for the purpose of drawing Cars on Inclined Planes;* John M. Palisse, and Sydney S. Durfee, Hudson, Columbia county, New York, February 25.

"The chain, or rope, after passing over the power wheel at the summit of the plane, and from which it receives motion, is reeved over pulleys attached to the cars, or other vehicles, to be drawn, and the ends of the said rope, or chain, made fast to windlasses, or any other contrivance, placed at, or near, the summit of the plane, for the purpose of obviating the elongation or contraction of the chain, but more particularly of the rope, if the latter is used.

"The advantage obtained by thus reeving the rope, or chain, on pulleys attached to the cars, or other vehicles, is, that part of the weight to be drawn being thrown on the stationary fastenings, or windlasses, at the head of the plane, an amount of leverage power is obtained, whereby the driving machinery, and, consequently, the rope, or chain, moved by it, are relieved of nearly one-half of the strain they bear, when used in the ordinary way."

The claims made are, "to the reeving the rope, or chain, on pulleys attached to the cars, or vehicles, used on the inclined planes of rail-roads and canals; also, the pulleys themselves, without distinction of shape, size, or material, when so attached to the cars, or other vehicles, as above, for the purpose of draft. To the windlasses, or any other sufficient contrivance, placed at or near the head or summit of the plane, for the purpose of securing the ends of the rope, or chain, and obviating the elongation or contraction of the chain, but more particularly of the rope, when the latter is used."

We have thus given the whole sum and substance of this specification, and it will be seen that the invention amounts to the raising of the load by a tackle, having a single movable pulley, which movable pulley is claimed, and must, of course, make a part of the invention, or discovery, of the patentees, who also claim, virtually, all methods, or contrivances, by which the end of the rope is to be fastened at the summit of the plane. To the discovery that the strain upon the rope is lessened "*nearly* one-half," should have been added that the load also will be raised with but one-half the velocity, when this well known contrivance is applied.

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33. For a *Cooking Stove;* Paul Wing, Grafton, Massachusetts, February 25.

There is certainly but little to claim in this stove, and but little is claimed. After describing parts which belong to a large portion of the different kinds of cooking and heating stoves now in use, and informing us that a tin kitchen is to be adapted to it, we are further told that "The front part of the kitchen, which is a part added to the kitchen now used for baking, is added to make it connect with the stove; and all I claim as my improvement, is the part thus added to the kitchen, and the application of it to the stove for the purpose

of cooking." That is, the making the kitchen in such shape as to fit against the stove in question, is the thing patented.

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34. For a *Machine for Cutting Meat;* John Morris, Derby, New Haven county, Connecticut, February 25.

This machine is not intended to cut meat in the manner of the ordinary sausage meat cutters, into minute particles, but into longitudinal shreds. The meat, separated from the bones, is to be put into a cylindrical vessel, or hopper, and a knife, of a peculiar construction, revolving horizontally, divides, or cuts, it into plates, whilst others, which are short, descending vertically, divide it into strips. We cannot attempt to give the construction and operation of the machine in detail, these occupying half a dozen pages in the specification. The patentee enumerates advantages in his machine, some of which appear to us to be overrated. He says that, "among those obvious, are the rendering soft and tender the parts of the flesh of animals naturally hard, and difficult of mastication. The preserving all the juices entire, and thereby avoiding the waste of them incident to the most common modes of preserving and preparing it for food, and thus retaining unexpended the peculiar flavour of each kind. And the facility of applying instantly, at all seasons, to each minute part of it, the means of preservation and seasoning, without incurring the danger of putrefaction consequent on the slow action of those means upon large masses, in the present mode of curing them."

We do not believe that our housewives, or epicures, will consent to have our hams and rounds of beef cut into shreds, and thus salted and served up, instead of having them presented in all their native beauty of form, exhibiting their well arranged layers of fat, and layers of lean, with which the idea of their excellence is so intimately associated.

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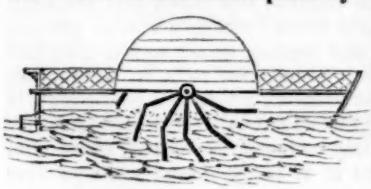
35. For *Propelling Wheels for Steamboats;* Nehemiah Dodge, city of New York, February 25.

The patentee calls his wheel, "The continual draught buoyant wheel." Much pains has been taken to cause the paddles of wheels to descend vertically into, and rise vertically from, the water, and we have here arrived at the mode of accomplishing the latter, without any difficulty whatever; as a set off, however, we are compelled to say, that it will be adopted without any advantages, and, according to our conceptions of the affair, with results, in some points, entirely the reverse of those anticipated by the inventor.



"The wheel is to be constructed like the ordinary paddle wheel, with the exception of the position of the floats, which, instead of standing in the direction of radii thereto, are to incline forward to an angle of 45 degrees." We are told that "this wheel, though simple in its construction, when attached to a steamboat under

way, will actually buoy up the boat, and as the blades recede from the water, there will not be that resistance which the common steamboat wheel is obliged to contend with; consequently, a steamboat constructed with wheels after the *model*, must pass through the water with much greater velocity. The speed of the boat can also be checked by wheels constructed after this manner, much sooner than by the common wheels, as the natural tendency of a backward motion in these is to draw the boat down in the water." We would advise the patentee to inquire into the advantage which would result from carrying out his principle to a greater extent, by placing his floats at an angle of ninety degrees with the radiating timbers.

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36. For a *Mortising Machine;* Grove Bradley, Auburn, Cayuga county, New York, February 25.

The nature of this machine is such as to require several figures in the drawing, in order to show the particular arrangement of those parts which are relied on as novel. The claim made to these would not, therefore, be understood from mere description, or, at all events, not without making it more elaborate than the nature of the subject would warrant.

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37. For a *Machine for Washing Potatoes, and other Roots;* William Ellis, Waterville, Kennebeck county, Maine, February 25.

The potatoes are placed in a cylindrical receptacle, the periphery of which is formed of slats, or rounds, and which is made to revolve in a trough containing water. A claim is made to "the application and construction of the cylinder, as set forth; and the adapting the trough beneath it to the use also as set forth."

Clothes have been washed in such machines, and no one will doubt that roots also may be cleaned by its agency. A patent, however, to give an exclusive right to that which has no novelty in its construction, will be pretty certain to be told out, should it make its appearance in a court of law.

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38. For *Branding and Stamping Apparatus;* Elijah Barnes, Gustavus Hills, and Ira B. Hawkins, Ashtabula, Ashtabula county, Ohio, February 25.

Movable letters, or types, are to be fixed in a stock, or case, much in the manner of those for marking linen, but a lip, or projection, is to be formed on the type, to prevent their falling out of the stock, when partially loose. "The whole claimed as our invention, and to be used either cold or hot for the purposes of branding, stamping, marking, labeling, printing, &c., with letters, figures, characters, &c."

May the book-binders, &c., use their movable types, as they have heretofore been in the habit of doing? Perhaps so, as there is no lip to keep them from falling out of the stock, or case.

*Specification of a Patent for a Machine for Thrashing Grain. Granted to* JOSEPH ROSS, *of Boundbrook, Somerset county, New Jersey, February 6th,* 1835.

To all whom it may concern, be it known, that I, Joseph Ross, of Boundbrook, in the county of Somerset, and State of New Jersey, did, on the 12th day of April, 1833, obtain letters patent of the United States, for a machine for shelling corn, and that I have since discovered that, by certain improvements, or variations therein, I can adapt the same to the thrashing of grain. My said improvement, however, being capable of being used as a thrashing machine, by applying the cylindrical body and concave herein described to any suitable frame, other than that used with my shelling machine; the only motive for combining the two being the saving of expense.

I make that part which is usually denominated the cylinder in thrashing machines, smaller in the middle than at the two ends, so that, instead of being a cylinder, it is, in fact, formed by the union of two truncated cones, at their smaller ends. The difference of diameter between the middle and ends may be about one inch; I prefer not to make the difference greater, as I can then use a concave, which is straight longitudinally, whilst, if the cylindrical part was made much smaller in the middle, it would be necessary to make the concave conform thereto, by giving it a rise in the centre; but I usually make the teeth driven into the cylinder to vary in length, so that their outer ends will, in revolving, pass each at the same distance from the concave.

I drive teeth into the cylindrical body, which teeth project from an inch to an inch and a half, and also drive similar teeth into the concave; these teeth may be of square three-eighths iron. I do not drive them straight, but incline them in both, in such a way as shall tend to prevent their breaking the straw, their slope separating them readily therefrom.

I usually cover the cylinder and concave with sheet iron, as this tends to render them the more durable.

In the frame of my shelling machine, this cylinder and concave may be substituted for the shelling apparatus, so that the one or the other may be used at pleasure; or I place this cylinder and concave in a suitable frame, without reference to the shelling machine; in either case, a proper feeding table, or any other well known contrivance for that purpose, may be used. The only thing which I claim as new, is the form given to what is usually denominated the cylinder, by making it smaller at the centre than at the ends, as herein described, the effect of which, it has been experimentally proved, is to prevent that annoyance from the current of wind and dust, produced in other machines for thrashing grain.

Although I have spoken of the revolving body as formed by the union of two truncated cones, the effect will be similar if, instead of

using the double cone, as described, the cylinder be made concave, in a regular curve, reducing its diameter in the middle, so that it shall be an inch, or upwards, less there than at the two ends.

JOSEPH ROSS.

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*Specification of a Patent for a Machine for Cleaning Clover, and other Seeds. Granted to* JOSEPH ROSS, *Boundbrook, Somerset county, New Jersey, February 6th,* 1835.

To all whom it may concern, be it known, that I, Joseph Ross, of Boundbrook, in the county of Somerset, and State of New Jersey, have invented a new and improved machine for the purpose of rubbing out and cleaning clover, and other seeds, and that the following is a full and exact description thereof.

I construct a frame to sustain a horizontal cylinder, and other parts of the apparatus, to be presently described. The cylinder may vary in length and diameter, according to the power by which it is to be driven. The cylinder is to be set with teeth of two kinds; one set of teeth may be from one-fourth to half an inch in length. These form circles round the cylinder, the circles being an inch, more or less, apart. Between these, rows of longer teeth, wires, or sprigs, are driven, which should not stand out more than one-sixteenth of an inch, their office being to rub the seed from the husk; a similar effect may be produced by covering the cylinder with punched sheet iron, or in other well known ways.

I use a concave which surrounds the cylinder for about three-quarters of its circumferencc. The part directly under the cylinder, extending about one-quarter of its circumference, may be of punched sheet iron, or of wove wire, with meshes of such size as will allow the seed, but not the chaff, to pass through. The remaining part of the concave, extending up to the apex of the cylinders, may be left smooth. The distance between the cylinder and the concave must be sufficient for the passage of the larger teeth.

The seed to be hulled is put into a hopper above the cylinder, the opening through the bottom thereof extending the whole length of the cylinder. In front of the cylinder I employ rubbers, which are made by taking wide strips of sole leather, the length of the cylinder, there being three, four, or more, such strips; these I confine between pieces of thin board, one piece being placed between each strip. The edge of the leather, where it touches the cylinder, projects beyond the thin boards, so as to give it the necessary play; each piece of leather is so notched as to allow the longer teeth to pass. The leather rubber, thus formed, slides in against the cylinder, and is, therefore, capable of being adjusted so as to press against it with greater, or less, force.

When the seed has passed the leather rubbers, the greater part of it falls through an opening on to the floor, whilst the chaff and the remaining seed, are, by the action of the longer teeth, carried imme-

diately over the perforated iron, or the meshes of wire work, of which the lower part of the concave is formed.

At the point where the smooth part of the concave commences, an opening may be made by lowering the bottom part of the concave, which is hinged in front for that purpose. Stones, or other hard substances, may be thus readily removed. A strip of leather is fixed along the edge of this opening, which extends to the cylinder, serving to check the too free passage of the seed round with the chaff, whilst, by its elasticity, it will allow the long teeth to carry the chaff beyond it. The back edge of the hopper has also a similar piece of leather upon it, which extends to the cylinder, and arrests the chaff, causing it to be blown out through an opening immediately behind the hopper, whilst that which contains seed, will, from its greater weight, be retained, and pass the leather, to be again rubbed.

What I claim as new in the foregoing machine, is the combination of long and short teeth in the cylinder, operating in the manner, and for the purposes, set forth. I also claim the leather rubber, constructed and acting in the manner described; not intending, by these claims, to limit myself to the precise arrangement set forth, but to vary the same in any way, whilst I produce the same effects by machinery operating substantially upon the same principle.

JOSEPH ROSS.

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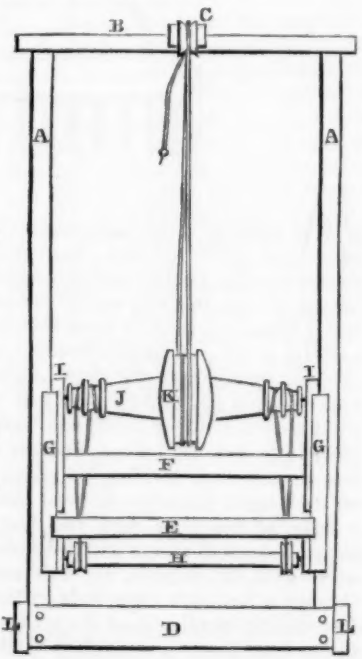
*Specification of a Patent for a Self-adjusting Cheese Press. Granted to* RUFUS PORTER, *Belerica, Middlesex county, Massachusetts, February 6th,* 1835.

Two posts, five feet long, four inches wide, and two inches thick, are placed parallel to each other, two feet apart, and having a cap piece across the top; and two pieces of plank, twenty-eight inches long, and six inches wide, are nailed to the bottoms, crossing from one to the other; and two other pieces, eighteen inches long, are nailed to each post, crossing at right angles with the first, and by which the posts are supported in an upright position; two planks, one of them ten, and the other six inches wide, extend horizontally from one post to the other, and constitute the bed and follower of the press. These are not attached to the posts, but the ends of the bed plank are attached by tenons, or nails, to four vertical sliding guides, two at each end, one of which is placed on each side of each post. These sliding guides are sixteen inches long, extending two inches below, and twelve inches above, the plank, which is also further supported by two cleats, one of which passes beneath each end of the plank, and is secured to the guides. A small shaft, having a gudgeon on pivots at each end, and a pulley three inches in diameter near each end, extends from one cleat to the other, under the centre of the plank. The ends of the follower plank, which is placed about six inches above the bed plank, are attached to two vertical, sliding planks, which are ten inches long, and four inches wide; being guided, or kept in place, by the four sliding guides, the two pairs of

which are an inch less distant than the two posts. Another shaft crosses above the follower, having gudgeons, or pivots, which enter the sliding planks. This shaft has a pulley, or grooved wheel, on its centre, of nine inches diameter, a groove at each end, of two inches diameter, and other two grooves, near the first, of three inches diameter. Two small ropes are made fast to the shaft within the two small grooves, and proceed thence downward through both planks, under the pulleys, and thence upward to the larger grooves, passing twice round the shaft, and are then made fast. Another cord extends from the cap piece downward, twice round the large pulley, thence upward over a small pulley which is attached to the cap, the end of the cord being at liberty. By this cord, the press planks, &c. are drawn upward, by which process the ropes are given off from the larger grooves, and are taken up by the smaller; the planks are thus permitted to separate, and a cheese may be placed between them, when, if permitted to descend, the press planks will approach each other, and produce a pressure equal to eighteen times the weight of the cheese to be thus pressed.

*Front view of R. Porter's Cheese Press.*

A A, posts.
B, cap.
C, small pulley.
D, bottom cross planks, or sills.
E, bed plank.
F, follower.
G G, sliding guides.
H, small shaft.
I I, sliding planks.
J, large shaft.
K, large pulley, or groove wheel.
L L, ends of the cross-planks.




I claim as original the arrangement of the pressing planks, guides, shafts, and pulleys; and the application to the pressing of cheese, of

the principle whereby pressure is produced, by giving off a rope from a smaller part of a shaft, at the same time that it is taken up by a larger part.

RUFUS PORTER.

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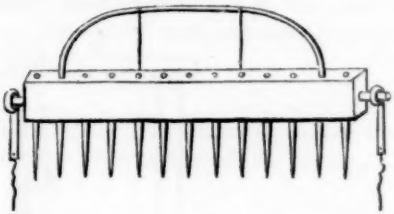
*Specification of a Patent for an improved Horse Rake. Granted to* NOAH BRIGGS, *New Hartford, Oneida county, New York, February 11th,* 1835.

To all to whom these presents shall come, Noah Briggs, of the town of New Hartford, in the county of Oneida, and state of New York, sends greeting:

Be it known, that I, this said Noah Briggs, have invented a new and useful improvement, not known or used before my invention, in the gathering of hay and grain, which I denominate an improved horse rake, the construction of which, and the manner of using it, are specified and described as follows, viz:



It is made of wood, and consists, 1st, of a head, which is composed of a head piece, or main shaft, twelve feet long, and three by four inches in size, having fourteen tapering teeth, each two feet long, inserted at one end into one of the narrow sides of the head piece, at equal distances, through mortises two inches long, and one inch wide.

2dly, of a round handle two inches through, in the form of a half ellipsis, sprung into the head piece eighteen inches from each end, and rising in the middle two feet three inches, having its plane at right angles with the teeth, and having two, or more, cords stretched from it to the head piece, at right angles with the same, and made fast at each end, dividing the plane of the handle into equal spaces on its longest diameter, or head piece side.

3dly, of two arms, each two feet long, and four inches by two in size, connected, at one end, with one end of the head piece, by means of an axle, or gudgeon, an inch and three-fourths through, passing through a two inch auger hole in the arm, having its lower side on a line with the handle side of the head piece, and projecting beyond the end of the head piece far enough to receive the arm, and admit a small half inch pin outside it, to hold it on; such angles, or gudgeons, moving freely in the arms, and being made fast to the head piece by pins, or gripes, or both. The head piece should be of light timber, not liable

to spring, or warp; and the teeth, handle arms, and gudgeons, should be of strong, hard timber.

This rake may be used for gathering hay into winrows, and into cocks, or bunches; also for gathering grain of most kinds into bundles, or bunches; and the manner of using it is as follows, viz: It is placed with the teeth lying on the ground, and the plane of the handle, of course, perpendicular to the ground, or nearly so. A horse is then put to it, by means of ropes of convenient length extended from his collar, and fastened to the arms at the ends not connected with the head, and draws the instrument in the position above mentioned, teeth foremost; the tender walking behind, and managing the rake by the handle. When it has collected as much hay, or grain, as the tender desires to collect at once, he loosens his hold of the handle, giving it, if necessary, a push, and the rake instantly rolls quite over, revolving forward on its axles, or gudgeons, in the arms, thus discharging its load, and at once resuming its position again, to collect another load.

The instrument may be very conveniently used, also, as a ladder, to mount a stack, or hay-loft, upon.

The principle on which this instrument operates, is that of the wheel and axle, the moving power being applied in such a direction by means of the position of the gudgeons, or axis of the machine, (as the gudgeons together may be termed,) as to cause the machine, whenever, in its sliding movement, it meets an impediment, to revolve at once upon its axis, thus surmounting the impediment by rolling over it. A mass of hay, or grain, collected upon, and forward of, the teeth, forms such an impediment; so that, in general, when the rake is thus loaded, and the tender wishes to drop the load, all he has to do is to let go his hold of the handle, and, the horse still going on, the rake instantly revolves, thus discharging its load, and at once resuming its position again, to collect another. In case the mass of hay, or grain, collected on and before the teeth, be very heavy, and the tender wishes to move it some distance before he drops it, to prevent the rake from revolving, and thus discharging the load sooner than he wishes, it will sometimes be necessary for him to throw his own weight, or some part of it, on the back part of the rake, by stepping with one foot, or both, upon the head piece. A little practise on the part of the tender, renders the management of the rake, in all its uses, very easy.

NOAH BRIGGS.

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*Specification of a Patent for an improved Plough. Granted to* NATHAN ROBINSON, *Sackett's Harbor, Jefferson county, New York, February 13th,* 1835.

To all whom it may concern, be it known, that I, Nathan Robinson, of Sackett's Harbour, Jefferson county, in the State of New York, have invented certain new and useful improvements in the

mode of constructing, or forming, the plough, and that the following is a full and exact description thereof.

The body of the plough is best made of cast-iron, as such instruments are now usually made, but the improvements which I have made are independent of the material, consisting of such alterations in its form and relative dimensions, as are calculated to obviate the objections most commonly made to the ploughs now in use, namely, their running hard, and their liability to become choked with dirt. The principal alterations I have made in the plough, to effect these objects, are by giving greater length to the body of it, and less curvature to the mould board, than have usually been given. In describing these improvements, I shall set down certain precise measurements and proportions; but it is to be distinctly understood that I do not intend thereby to limit myself in these particulars, but merely to exemplify the principle upon which I proceed, and to give information to those who might otherwise be at some loss in carrying my plan into operation.

From the point, or nose, of my plough, to the junction of the shank and mould board, it is formed to a radius of about seventy-two inches, keeping the same curvature, or nearly the same, through to the hinder part of the mould board, this being about the medium convexity which the under side of the furrow slice naturally takes in being raised and turned over. From the commencement of the circle at the point, or nose, I sweep up till I have raised the share of my plough about ten inches from the bottom of the land side, this being the seat, or junction, of the stem to the mould board; presenting a thin, flat wedge, and a nearly straight ascending plane, of about twenty inches, to the earth. At this point the furrow slice lies on an angle of 31° from the surface of the earth from which it is raised. From the junction of the shank to the mould board, I run back on a straight line about twenty-eight inches, and on an angle of about 40° with the land side, making my plough about twenty-one inches wide at the hind part. My share I proportion in length to the other parts of my plough; commencing about two inches above the point, I draw a line back on about the same angle with the land side that the upper edge of the mould board has, till I have obtained a sufficient width from the land side, which is about twelve inches. The long edge, which is thus presented to the furrow slice, separates it readily and evenly from the solid earth. At the termination of my share, which is about sixteen inches from the starting place, at the point, I turn an angle in the lower part of my mould board, in the usual manner; but I carry the bottom edge of the mould board back even with the bottom edge of the land side, leaving the heel thereof as many inches from the land side as the share is at the widest point; these three points then stand at right angles with each other. The bottom of my plough being about thirty inches long, I make the hind end of my mould board to slope back sufficiently to give to my plough a length of about forty-seven inches from the point, or nose, to the extreme point of the mould board.

I will now give some further particulars respecting the relative

dimensions of my plough, taken from one which I have made, and the operation of which I have tested by satisfactory experiments. Share on an angle of 31° with the bottom of the land side; the upper edge of the mould board is at an angle with the land side flatwise, 40°; the edge of the share with the land side, 32°; length of the plough on the bottom of the shank to the point of the mould board, 30 inches; the edge of the share, 17 inches; from the termination of the share to the heel of the mould board, 13 inches; cutting width at the point of the share, 11½ inches; parting off width on the bottom, 11½ inches; circle of the shin, 72 inches radius; circle of the concavity of the mould board, nearly the same; from the nose to the extreme point of the mould board, 46 inches; width of the mould board, 13 inches; overjet, 7½ inches.

It will be manifest to any person that these measurements may be departed from, to a certain extent, without thereby essentially altering the character of my plough; and it will also be evident to those who are acquainted with the construction of ploughs in general, that the form which I have given to mine, by proportioning the different parts to each other, is such as impresses upon it a character by which it will be readily distinguished from others. What I claim, therefore, as my invention, is a plough formed upon the principles, or in the manner, herein set forth, by which it is made to run more easily and cleanly than those now in use.

NATHAN ROBINSON.

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*Specification of a Patent for a new and improved mode of constructing a Mill Bush, or Spindle Box, for Flour Mills; and also of making and fixing a Ring and Bale in the Eye of the upper Stone. Granted to* WARREN P. WING, *of Greenwich, Hempstead county, Massachusetts, February 20th*, 1835.

To all whom it may concern, be it known, that I, Warren P. Wing, of Greenwich, in the county of Hampshire, and State of Massachusetts, have invented certain improvements in the manner of fixing the mill bush, or spindle box, and of constructing a ring and bale to be fixed in the eyes of millstones for the grinding of flour, or other articles; and I do hereby declare that the following is a full and exact description thereof.

I make a box, usually of cast-iron, which I adapt in size to the eye of the stone. For the sake of facility of description, I will give the dimensions of one which I have made, and which, after a fair trial, has been found to answer well in practice.

The box has a top, which top fits on to it, like a snuff-box. It is ten inches in diameter, and five inches in depth, the outer rim being three-fourths of an inch in thickness. The bottom and top are both perforated in the centre, so as to allow the mill spindle to pass through them. This box is to contain three bearing pieces, of block tin, or of any proper mixed metal, which are to be simultaneously forced up against the spindle, and which are in contact with it for

about three-fourths of its circumference, the remaining fourth being exposed to the cooling influence of the air. These metal bearings are cast into a follower of cast-iron, a birds-eye view of which resembles the letter H, the outer end of which receives the cam, or eccentric, by which the bearings are to be forced up against the spindle. Cells to receive these followers are formed within the box, by six wings, or cheeks, extending from the top to the bottom, the sides of each of the three cells thus formed being parallel to each other, that the followers may slide readily and truly therein; these wings are, of course, cast with the box. The void spaces between them admit of the contact of air with the spindle, and one of them is to be used for another purpose, to be presently described.

Between the rim of the box, and the crossbars of each of the followers, the bottom is perforated to allow the passage of round rods of iron, the upper ends of which are formed into cams, or eccentrics, for forcing up the followers, and, for this purpose, extend up through the whole depth of the box. The lower ends of the above named round rods, or spindles, extend down sufficiently below the bed stone to allow of their being acted upon conveniently, as they are all to turn at the same time. The turning them simultaneously may be effected in various ways, but that which I deem the most simple is by attaching each of the spindles to a ring, by means of a jointed crank, so that, when the ring is made to revolve, the followers will all advance at the same time; other modes will occur to any skilful mechanician, and need not, therefore, be specified.

The cover of the box I make somewhat convex; it need not be more than one-fourth of an inch in thickness; besides the perforation in its centre for the spindle, I usually drill, or cast, holes through it, near the inner edge, which I fill with wood, in order to nail the elastic collar thereto.

In order to lubricate, or oil, the spindle, I drill a hole through the bottom of the box, near the periphery, and in one of the angles formed by it, and one of the before named wings, or cheeks, in one of the void spaces. A rod extends down through this hole, in the manner of those attached to the eccentrics, and this carries a leaf within the box, to which a sponge containing oil, or a lump of grease of any suitable kind, may be attached. By turning this rod, the oil, or grease, is brought into contact with the spindle, and lubricates it; and this may be done in a moment, as often as it is found necessary.

My improvement in the bale and ring consists in casting them in one entire piece, in such way that the ring may be let into, and firmly affixed in, the eye of the stone. The bale rises as a semicircle above the ring, or forming such other curve between two opposite points on the diameter of the ring, as shall adapt it to the cock heads of spindles already made. Gains, or notches, are made under the ends of the bale, in the ring, to receive the driver.

What I claim as my invention, is the construction of a spindle box, in which the followers are moved up by eccentrics, or cams, without the necessity of stopping the mill, and operating substantially in the manner described.

I also claim the arrangement for lubricating, as herein described, and likewise the manner of constructing the ring and bale in one piece, as herein set forth; not, however, intending to confine myself to the exact form which I have described, but to vary the same in any manner which I may think proper, whilst the like ends are attained by means substantially the same.

WARREN P. WING.

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## TRANSLATIONS FROM FOREIGN JOURNALS.

### *On the Action of Hydro-chlorate Muriatic Acid Gas on Silver, at a high temperature. Theory of the Method of Parting in the Dry Way.* By M. BOUSSINGAULT.

(Translated for this Journal, by Jos. Wharton.*)

By the phrase *parting in the dry way*, the old chemists designated an operation by which they were able, by a long continued cementation, to remove, almost entirely, silver, and the other metals that are found alloyed with gold. This process has its origin in the highest antiquity, and it was not till near the year 1350, that the method of parting by aquafortis began to be at all known throughout Europe; while, owing to the high price of the acids, the use of this process was, for a long time, confined to the laboratories of experimenters, and the operations by the dry way, such as sulphuration by crude antimony, (sulphuret of antimony,) treatment with corrosive sublimate, and cementation with white clay and salt, continued to be employed for the purification of gold.

Since that time, however, among the various results effected by the great progress of the arts dependent upon chemistry, the great diminution in the price of the acids, that followed as a consequence, soon rendered the method of parting in the wet way practicable on a large scale; and it is generally known to what a high degree of perfection the refining of gold and silver is now carried, by the French in particular, so that, at the present day, the ancient processes have been entirely abandoned throughout Europe.

But the European arts, which were established in the new world at the period of its discovery, have remained there so nearly stationary, that I found, not long since, in various workshops, the processes of the middle age. Thus, in establishments as important as the mints of New Granada, the separation of the silver contained in the gold of the mines, is still effected in the dry way. I could hardly have been placed in circumstances of a more interesting nature than thus to find myself, as I did, among the instruments of the period of the chemistry of the furnace, and even to meet, scientifically speaking, with the men of that epoch. It was as if I had met with chemists, who had just waked up, after a sleep of three centuries.

* At the request of the Committee on Publications.

about three-fourths of its circumference, the remaining fourth being exposed to the cooling influence of the air. These metal bearings are cast into a follower of cast-iron, a birds-eye view of which resembles the letter H, the outer end of which receives the cam, or eccentric, by which the bearings are to be forced up against the spindle. Cells to receive these followers are formed within the box, by six wings, or cheeks, extending from the top to the bottom, the sides of each of the three cells thus formed being parallel to each other, that the followers may slide readily and truly therein; these wings are, of course, cast with the box. The void spaces between them admit of the contact of air with the spindle, and one of them is to be used for another purpose, to be presently described.

Between the rim of the box, and the crossbars of each of the followers, the bottom is perforated to allow the passage of round rods of iron, the upper ends of which are formed into cams, or eccentrics, for forcing up the followers, and, for this purpose, extend up through the whole depth of the box. The lower ends of the above named round rods, or spindles, extend down sufficiently below the bed stone to allow of their being acted upon conveniently, as they are all to turn at the same time. The turning them simultaneously may be effected in various ways, but that which I deem the most simple is by attaching each of the spindles to a ring, by means of a jointed crank, so that, when the ring is made to revolve, the followers will all advance at the same time; other modes will occur to any skilful mechanician, and need not, therefore, be specified.

The cover of the box I make somewhat convex; it need not be more than one-fourth of an inch in thickness; besides the perforation in its centre for the spindle, I usually drill, or cast, holes through it, near the inner edge, which I fill with wood, in order to nail the elastic collar thereto.

In order to lubricate, or oil, the spindle, I drill a hole through the bottom of the box, near the periphery, and in one of the angles formed by it, and one of the before named wings, or cheeks, in one of the void spaces. A rod extends down through this hole, in the manner of those attached to the eccentrics, and this carries a leaf within the box, to which a sponge containing oil, or a lump of grease of any suitable kind, may be attached. By turning this rod, the oil, or grease, is brought into contact with the spindle, and lubricates it; and this may be done in a moment, as often as it is found necessary.

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In the mint of Santa-Fé, cementation, or parting in the dry way, is always employed, when it is desired to free the gold of the mines from the silver that is combined with it, oftentimes in large proportions, so as to bring it to the state of purity required by the law for the regulation of the gold coinage.

The argentiferous gold being first reduced to the granular state, is subjected to the process of cementation in kettles of porous earth. The cement is composed of two parts of brickdust, and one of powdered sea salt, mixed together. A layer of this cement is first spread out on the bottom of the vessel, and is then covered with the granulated ore; this last is then covered with a fresh layer of cement, and so on. The layers of cement should be about an inch in thickness. A cementing pot contains, generally, from ten to fifteen pounds (French) of gold.

The furnace in which the cementation is effected, is a hollow cylinder, four and a half feet in diameter, by nine feet in height; at about three feet from the ground, is placed a grate, on which the cementing pots stand. At the bottom of the furnace, on the very level of the ground, an opening is made, through which the fuel is introduced. This furnace has neither fire grate nor chimney, and the cementing pots are put in and taken out from above.

The operation requires from twenty-four to thirty-six hours, varying with the quantity of silver to be extracted; the cementing pots are kept at a cherry red heat.

The operation being finished, the cement is washed in water, which causes the gold to separate in grains, of about twenty-one to twenty-two carats. These are melted together into bars of a suitable size, for *lamination*.

The cement, after being pounded into a fine paste, is mixed with one-tenth its weight of sea salt, and then amalgamated with mercury. The mercury added is nearly ten times the amount of silver present in the cement. The process of amalgamation is carried on in large wooden troughs, at a temperature varying from 14° to 18° of the Centigrade scale, (57.2° to 64.4° Fahrenheit;) the operation requires from four to five days.

The chloride of silver enclosed in the cement is reduced by the mercury, during the process of amalgamation; chloride of mercury is formed, and carried off in the washings; while the metallic silver amalgamates with mercury. This amalgam is always very dry, on account of the large quantity of chloride of mercury diffused through its mass. The silver obtained after driving off the mercury, is nearly pure, containing only a few thousandths of gold. In the process of cementation, the silver is converted into a chloride by the action of the dry clay, and the equally dry marine salt, a reaction which does not receive a satisfactory rationale from the facts hitherto determined on the subject.

But, however this may be, since the process was attended with success, in the case of argentiferous gold in large sized grains, I determined to apply it to the extraction of silver contained in powdered gold, extracted by washing from pyrites. This gold ordinarily contains 0.26 of silver; but before operating on large quantities, I wished

to attempt certain modifications, by erecting a furnace more economical in point of fact, but particularly by the substitution of Cornwall crucibles, for holding the mixed powders, instead of the fragile vessels above referred to, so that the chances of fracture might be diminished as far as possible. With this view, the mixture of powdered gold and cement was placed in a crucible, and exposed for thirty hours to the heat of a furnace, wood charcoal being used for fuel. At the end of this time, the standard of the gold was not sensibly altered; a result which, it will be admitted, was calculated to surprise. I had the patience to keep the powdered gold under the heat for seventy-two hours; but, notwithstanding, the gold was found, after the operation, to contain almost as much silver as before it was subjected to the fire. In a word, all my efforts with good crucibles uniformly failed, and I was forced, to the great satisfaction of the workmen, to return to the *ancient* method of operation. It seemed extremely probable that the access of air was indispensably necessary to ensure the success of the cementation; it was, at least, only in this way that I could account for the advantage presented by badly burnt and porous earthen vessels, over crucibles of a good quality, and, so to speak, impermeable. To satisfy myself on this point, I made the following experiment.

I took two laminæ of silver, weighing each 24.6 grains; one of these I placed in the centre of a small porcelain vessel, filled with a cement of sea-salt and brickdust; the vessel was placed in the centre of a crucible, and covered over with charcoal powder, heaped up around it; so that all precautions were taken to keep the metal out of contact with the air. The other silver plate was, on the contrary, exposed on a cupel containing the cement, and the cupel was placed under the muffle of an assay furnace; so that, in this case, the access of air was facilitated as much as possible. Heat was applied for seven hours; the sheet enclosed in the crucible had not, at the end of that time, materially diminished in weight; it still weighed 24.3 grains; while, on the contrary, that placed under the muffle weighed only 9.5 grains; it had, consequently lost 15.1 grains. The surface of the second plate was much corroded, and the cement was impregnated with chloride of silver.

The presence of air was thus shown to be indispensable to the success of the cementation; but its action, in the conversion of the silver into a chloride, still remained to be examined. I first endeavoured to determine whether sea salt alone could attack silver at a red heat; but a sheet of this metal, placed in a cupel, under the muffle, and covered over with sea salt, experienced no alteration, even after being subjected for three hours to the heat. During the progress of this experiment, I had occasion to observe the great increase in the volatility of chloride of sodium, produced by the passage of a current of very hot air. The salt, as soon as it was placed in the cupel, (under the muffle,) gave out fumes in abundance, and, in a short time, was entirely dissipated.

It follows, then, from this experiment, that the presence of the clay, also, is essential to the conversion of the silver into a chloride,

by the action of sea salt; and as it is composed of silica and alumina, it appeared worth while to study separately the action of these two substances.

Two laminæ of silver, weighing each 6.5 grains, were accordingly placed in two different cupels; in one of these cupels was put a cement, composed of silica and sea salt; in the other, a cement composed of alumina, and the same. For four hours, the muffle of the furnace was kept at a heat above a cherry red; at the end of this time, the silver in the aluminous mixture had completely disappeared. On cooling, the cement belonging to this cupel was slightly agglutinated; it presented a crystalline structure, but was not sensibly saline to the taste. When first taken from the furnace, it was of a brilliant white appearance, but on exposure to the solar rays, it soon acquired a deep violet tint; the sheet enclosed in the silicious cement still weighed four grains; it presented a very striking crystalline appearance, over the whole extent of its surface; certain points were covered with a plaster, so to speak, of an olive green, which adhered strongly to the metal; the parts of the cement that had been in contact with the silver, were of a deep brown colour. The cement was not saline to the taste, and was almost wholly vitrified. It is doubtless to this last circumstance that the failure of the cementation with the silicious mixture must be attributed.

It is known that, even at a high temperature, silica exerts positively no action upon sea salt, if the materials be perfectly dry; but the researches of MM. Thenard and Gay Lussac, have shown that the presence of watery vapour immediately determines an energetic action, attended by the disengagement of hydro-chloric acid gas, and the formation of silicate of soda. It is evident, then, that, in the above experiment with the silicious cement, vapour of water was present, since the chloride of sodium was vitrified by the silica. The air, in traversing the muffle of the cupel furnace, must, then, have carried with it a sufficient quantity of watery vapour to establish the reaction. In cementation on a large scale, such as is carried on at Santa-Fé, the cementing materials are constantly surrounded with watery vapours, produced during the combustion of the wood.

To prove that it is really the vapour of water constantly present in the atmosphere, or that produced during the combustion of the fuel, which renders the presence of air necessary in the cementing process, I placed a sheet of silver, surrounded with cement, in a porcelain tube, and, after raising it to a red heat, caused a stream of well dried air to pass through it; as I expected, the silver suffered no change whatever. A difficulty, however, still remained. If, as seemed evident, the vapour of water be the agent that determines the action of the earths on the sea salt, hydro-chloric acid should, indubitably, be produced; and as we have found that the silver is transformed into a chloride, and no hydro-chloric acid is evolved, it follows, as a probable consequence, that the last named substance is decomposed by silver at a red heat, though this metal is generally supposed to exert no action whatever on hydro-chloric acid gas, even at high degrees of heat; this point remained, then, to be determined.

A lamina of silver, twisted into a spiral, was introduced into a tube of porcelain, and placed in a furnace. By one end of the tube was introduced a current of hydro-chloric acid gas, previously dried by passing through chloride of calcium;* at the other extremity was fitted a tube, entering under a bell glass filled with water. When the heat rose to a red, hydrogen gas began to be disengaged, but very quickly ceased coming over, the acid gas then continuing its passage, without decomposition, and the water of the bell glass became acid. On examination, the surface of the silver was found to be covered with a varnish of chloride of silver, and it was clear that the metal had been protected from further contact with the acid by the coating thus afforded it.

To remedy this difficulty, in a measure, the silver lamina was surrounded with alumine, for the purpose of absorbing, as much as possible, the chloride produced. This second experiment succeeded much better than the former, and I was enabled to fill several test tubes with the hydrogen evolved; the exit of this gas under the receiver took place, however, in very small bubbles, and it was easy to perceive, from the strong acidity of the water, that the greater part of the acid still escaped decomposition. The evolution of hydrogen became slower and slower, and soon entirely ceased. The silver, when examined, was found to be much corroded, although the chloride produced had entered but very little into the body of the alumine, and the metal was still covered with a layer of chloride, which was a sufficient reason why the silver had escaped final destruction.

In a second experiment, in which I added sea salt to the alumine, the operation continued without interruption, although, as in the preceding experiments, the hydrogen was evolved in very small bubbles, and the greater part of the acid passed over without decomposition. The addition, in this case, of the sea salt, was found to have greatly facilitated the diffusion of the chloride of silver through the alumine, and it is more than probable that the effect is due to the tendency of the two chlorides to combine together. The double chloride thus produced may be formed directly by the addition of chloride of silver to chloride of sodium, in a state of fusion. When thus formed, it solidifies, on cooling, to a low red heat, and, when cold, is vitreous,

* In my first experiments, I did not adopt the precaution of drying the acid; but in consequence of a suggestion that the effect might be possibly due to the decomposition of water, the affinities called into play being those of silver for oxygen, and of hydro-chloric acid for the oxide of silver, in which case, the hydrogen evolved would be furnished by the water, I caused the gas, in my succeeding experiments, to pass previously over chloride of calcium. An objection might, however, still be raised; it might possibly be the case, that the gas was not completely dessicated by the chloride, but that a portion of aqueous vapour still remained. To determine whether this be the case, I made use of a test previously employed by MM. Thenard and Gay Lussac. I caused a portion of the dried gas to pass into a receiver of fluoboric acid gas, but the mixed gases retained the transparency they possessed when separate. The extreme sensibility of the fluoboric acid gas, as a hygroscopic agent, was shown by the admission of atmospheric air into the mixture, when a cloud was instantly produced.

transparent, and slightly opaline; its taste is saline, and not at all metallic; it is decomposed by the contact of water. Exposed to the solar light, its colour changes to a violet.

I further demonstrated the action of hydro-chloric acid on silver, as follows:

A very thin lamina of this metal, weighing 13.3 grains, was put into a cupel, and a current of the acid gas was caused to flow, for an hour's time, under the muffle of the furnace in which it was placed. During the whole of the experiment, a light white vapour arose from the cupel. The silver, after the operation, was found to weigh only 9.5 grains; its surface was corroded; no trace of chloride was observable on the cupel; in this case, the chloride was evidently carried off, at the instant of its formation, by the gaseous stream. It might be supposed, from the power possessed by silver of fixing oxygen at high temperatures, that, during the cementing process, the contact of the air facilitated the action of the acid by furnishing that gas; but a comparative experiment, made with two silver laminæ, presenting exactly the same extent of surface, showed that this is not the case, and that the oxygen of the air does not sensibly facilitate the action of hydro-chloric acid on silver.

The decomposition of hydro-chloric acid by silver, is an analogous fact with that of the decomposition of water by iron. The silver absorbs the chlorine of the acid gas, in like manner as the iron does the oxygen of the watery vapour, and hydrogen is set at liberty in both cases. On the other hand, at the same temperature at which these decompositions are produced, hydrogen gas possesses the property of reducing to the metallic state, the chloride of silver, and the oxide of iron, with the production, respectively, of hydro-chloric acid and water.

When silver is submitted to a continuous current of hydro-chloric acid gas, the hydrogen evolved is immediately enveloped in so large a quantity of the acid gas, that the mixture is too dilute—the hydrogen being considered the active agent—to react on the chloride already formed; the hydrogen, moreover, is rapidly carried off by the gaseous current.

When, on the other hand, chloride of silver is reduced by a current of hydrogen, the inverse is the case; the hydro-chloric acid produced is rendered inactive, by reason of the large amount of free hydrogen present.

To convert silver into a chloride by the action of hydro-chloric acid gas, it will then be necessary to employ a great excess of the latter; and, on the other hand, to reduce the chloride of silver, a much greater amount of hydrogen will be required than is simply sufficient to convert the chlorine into hydro-chloric acid.

The fact of the decomposition of hydro-chloric acid by silver once admitted, the phenomena that ensue during the process of *parting in the dry way*, are readily explained; the clay of the cement, assisted by the presence of watery vapour, reacts on the sea salt; hydro-chloric acid results, and converts the silver into a chloride. The chloride thus produced combines, probably, with the sea salt, and

forms with it a double chloride, which is absorbed by the mass of the cement, so as to leave the surface of the silver perfectly clean. A fresh portion of the hydro-chloric acid is thus permitted to act on a fresh surface of the silver, and the operation is thus enabled to continue until the latter has been entirely converted into chloride.

(*Annales de Chem. et de Phys.*

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### *Mode of Joining two Pieces of Amber.*

[Translated for this Journal, by John R. Warder.*]

Two pieces of amber may be very readily united by the following means.

Wet the surfaces that are to be united with a solution of caustic potash; heat them, and then press them together; the two pieces will unite so perfectly, that no trace of any joint can be perceived. Thus, with small pieces of amber, compact masses may be easily formed, which is an advantage in the arts.

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### *Process for obtaining the Sub-carbonate of Lead, or White Lead, by treating the Sulphate of this Metal with the Carbonates of Potash, or Soda, and for making Acetate, Nitrate, and Hydrochlorate, of Lead, by the reaction of the Carbonate of Lead, and Acetic, Nitric, and Muriatic Acids.* By M. A. Penot, *Professor of Chemistry applied to the Arts.*

[Translated for this Journal, by John R. Warder*.]

The principle upon which this process depends, is known to every chemist, but I believe it has never been applied to common use in the arts.

For some time there has been made annually in the numerous manufactories of printed calicoes in the department of the Upper Rhine, an immense quantity of sulphate of lead, which, until now, they have vainly endeavoured to turn to account, so that the manufacturers try to get rid of it, as an encumbrance.

I think, therefore, I have applied a principle of chemistry in a new way, and favourable to practice in the arts, by making use of a product which has, until now, been thrown away, for the formation of another production, for which we are, as yet, tributary to foreign nations.

#### *To obtain the Sub-carbonate of Lead.*

Boil in a cauldron,

| | |
|---|---|
| Real sub-carbonate of soda, | 54 lbs. |
| " " potash, | 70 " |
| With sulphate of lead, | 150 " |

* At the request of the Committee on Publications.

When it no longer effervesces with an acid, the operation is ended; there is then withdrawn from the composition,

| | |
|---|---|
| Sulphate of soda, in solution, | 72 lbs. |
| Sulphate of potash, in solution, | 88 " |
| Sub-carbonate of lead, or ceruse, precipitated, | 134 " |

*To obtain the Acetates, Nitrate, and Hydrochlorate, from the same basis.*

To extract these salts, it is necessary to add gradually, to avoid too great an effervescence to the 134 lbs. of sub-carbonate of lead before obtained,

| | |
|---|---|
| Real acetic acid, | 50 lbs. |
| " nitric acid, | 54 " |
| " hydrochloric acid, | 37 " |

By this means are obtained,

| | |
|---|---|
| Acetate of lead, | 152 lbs. |
| Nitrate of lead, | 166 " |
| Hydrochlorate of lead, | 159 " |

In each of these cases, the operation is at an end, when there is no effervescence upon casting the acid upon the sub-carbonate of lead.

*Observations.*

My process for obtaining the acetate, nitrate, and hydrochlorate of lead, would become more costly than those which are at present followed, if I were obliged to buy the white lead of commerce, but by employing only that obtained by the processes that I have just described, with the articles at the price at which I have estimated them, these products may be delivered at the present current prices.

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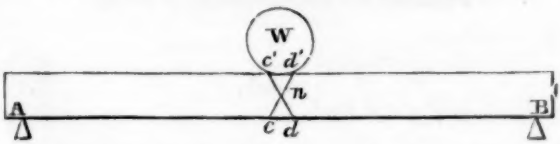
*Report to the Directors of the London and Birmingham Railway Company, accompanied by Experiments on the Transverse Strength, &c. of Malleable Iron, with reference to its use for Railway Bars.* By Peter Barlow, *Prof. Royal Mil. Acad., Woolwich.*

(Continued from page 127.)

*Experiments to determine the comparative Resistance of Malleable Iron to Extension and Compression, and the Position of the Neutral Axis in Bars submitted to a Transverse Strain.*




Let A B represent an iron, or any other bar, supported at A and B, and loaded in the middle by a weight, W, which deflec s

it, extending the fibres between $n$ and $c\ d$, and compressing those between $n$ and $c'\ d'$. Now, supposing the system in equilibrio, $\frac{1}{2}$ W acting at the extremity of the $\frac{1}{2}$ length, or $\frac{1}{4}\ l$ W, is equivalent to the sum of all the resistances to extension in $n\ c\ d$, and to all those of compression in $n\ c'\ d'$; each fibre acting on a lever equal to its distance from the neutral axis, $n$. Consequently, as the quantity of extension of any fibre is as its distance from the neutral axis, and the lever by which it acts being also as that distance, the actual resistance of a fibre at the distance, $x$, is as $\frac{x^2 t}{d'}$ $t$ being the tension of the lower fibre, and $d'$ its depth below the neutral axis; and the sum of all these resistances will be $\int \frac{t\,x^2 d\,x}{d'} = \frac{1}{3}\ d'^2 t$, (when $x = d'$) or for the whole depth. In the same way, $c$ being taken to denote the compression of the upper fibre, corresponding to the tension, $t$, the sum of all the compressions will be,

$$\frac{1}{3}\ d''^2\ c,$$

$d''$ denoting the depth of compression; hence the whole sum is,

$$\frac{1}{3}\ d''\ c + \frac{1}{3}\ d'^2 t = \frac{1}{4} \text{W}\ l;$$

but $d''\ c = d'\ t$,* the quantity of resistance being equal to that of extension; this, therefore, becomes

$$\frac{1}{3}\ d''\ d'\ t\ +\ \frac{1}{3} d^2 t = \frac{1}{4}\ l\ \text{W}, \text{ or}$$

$$\frac{1}{3}\ (d'' + d')\ d'\ t = \frac{1}{4}\ l\ \text{W}, \text{ or}$$

$$\frac{1}{3}\ d.\ d'\ t = \frac{1}{4}\ l\ \text{W}.;$$

$d$ being the whole depth, and $d'$ the depth of tension; whence

$$d' = \frac{3\ l\ \text{W}}{4\ d\ b} = \text{depth of tension, and}$$

$d - d'$ the depth of compression;

* To prevent misapprehension, it may be proper to observe, that $c$ here is not intended to represent the force requisite to compress a fibre the same quantity that the force $t$ extends it; but simply the force of compression at $c$, corresponding to the tension $t$ on the lower fibre. The equation, therefore, $d''\ c = d'\ t$, is equivalent to saying that the sum of all the forces in $n'\ c'\ d$ is equal to all the forces in $n\ c\ d$, or that $a\ g = n\ a'\ g'$; $a\ a'$ denoting the areas, and $g\ g'$ the distances of the centres of gravity from $n$, and taking $n\ t$ to denote the force which will compress a fibre to the same extent as the force $t$ will extend it.

consequently, $\frac{d'}{d-d'}$ the ratio, in which the neutral axis divides the sectional area into rectangular bars.

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*Comparison of the Formula with Experimental Results.*

In order to submit this formula to practical results, a strong iron frame was forged, of the form shown in fig. 1; D C is thirty-six inches long, six inches broad, by two deep; the arms two inches square, and the ends of proportional dimensions to those represented. The other view of the arms is represented in fig. 2, with an opening six inches by three, in which the bars for experiment were placed, as represented by A G B; the space between is thirty-three inches. The shackles were applied at E and G, and connected by strong iron cables to the press; the strain was then brought on, and the results recorded.

Fig. 1.

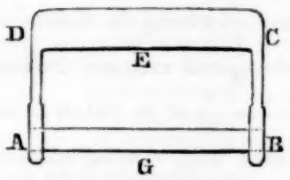


Fig. 2.

In order to measure, with every requisite accuracy, the deflections which the bar sustained, as different weights were applied, an instrument, of the form shown in fig. 3, was neatly and accurately made in iron, having two feet, A D, B C; the centre was tapped to receive the brass screw, H S, of twenty threads to the inch, and the head was divided into five equal parts; and by again subdividing these divisions into ten, a deflection of $\frac{1}{1000}$ of an inch might be measured with great ease.

Fig. 3.

The method of applying it, was to rest its feet on the bar, and then to retain it in its place by cramps and screws. The micrometer screw was then run down till it was in contact with the bar, and the divisions read and registered, either before any strain was on, or when the first slightest strain could be estimated, as stated in the following table.

The first six experiments were made on different parts of the bars, Nos. 5, 6, and 7, without cutting them, by introducing them into the iron frame above described, (having thirty-three inches clear bearing,) and straining them till the successive deflections showed a tendency to increase in amount, which was taken as a sign of the elasticity being injured; and the amount of this strain having been previously ascertained by the former experiments, they furnish the best possible data to apply to the formula for determining the position of the neutral axis.

*Experiments made to ascertain the Deflections due to different Transverse Strains, and the weight which first produces a Strain equal to the Elastic Power, and thence the position of the Neutral Axis.*

TABLE III.

| Part 1. Bar No. 5. Bearing 33 inches. 2 inches square. | | | Part 2. Bar No. 5. Bearing 33 inches. 2 inches square. | | |
|---|---|---|---|---|---|
| Weight in tons. | Readings by scale.* | Deflections for each half ton. | Weight in tons. | Readings by scale. | Deflections for each half ton. |
| No weight | 1.96 | | No weight | 1.95 | |
| .875 | 1.92 | .023 | .750 | 1.92 | .020 |
| 1.00 | 1.90 | | 1.00 | 1.91 | .020 |
| 1.50 | 1.90 | .016 | 1.50 | 1.89 | .020 |
| 2.00 | 1.88 | .020 | 2.00 | 1.86 | .030 |
| 2.50 | 1.86 | .020 | 2.50 | 1.84 | .020 |
| Weight removed. | returned to 1.96 | | Weight removed. | returned to 1.95 | |
| 3.00 | 1.80 | Elasticity injured. | 3.00 | 1.67 | Elasticity injured. |
| Weight removed. | 1.88 | | Weight removed. | 1.81 | |

| Part 1. Bar No. 6. | | | Part 2. Bar No. 6. | | |
|---|---|---|---|---|---|
| Weight in tons. | Readings by scale. | Deflections for each half ton. | Weight in tons. | Readings by Micro. Screw. | Deflections for each half ton. |
| No weight | | | No weight | .025 | |
| .50 | 1.56 ? | | .50 | .043 | .018 |
| 1.0 | 1.50 | .020 | 1.0 | .068 | .025 |
| 1.5 | 1.48 | .030 | 1.5 | .091 | .023 |
| 2.0 | 1.45 | .210 Elas. | 2.0 | .128 | .037 injur'd |
| 2.5 | 1.24 | inj'd. | 2.25 | .178 | .100 |
| 3.0 | | | 2.50 | .313 | .185 |

* In the first of these experiments, the deflections were measured by a scale in front of the bar, the micrometer screw not being ready.

TABLE III.—(*Continued.*)

| Part 1. Bar No. 7. | | | Part 2. Bar No. 7. | | |
|---|---|---|---|---|---|
| Weight in tons. | Readings by Mic. Screw. | Deflections for each half ton. | Weight in tons. | Readings in Mic. Screw. | Deflections for each half ton. |
| No weight | .031 | | No weight | .025 | |
| .50 | .053 | .022 | .50 | .056 | .031 |
| 1.0 | .077 | .024 | 1.0 | .077 | .021 |
| 1.5 | .096 | .019 | 1.5 | .098 | .021 |
| 2.0 | .126 | .030 | 2.0 | .109 | .011 |
| 2.5 | .147 | .021 | 2.5 | .137 | .028 injur'd |
| 3.0 | .211 | .064 injur'd | 3.0 | .180 | |

| Part 3. Bar No. 7. | | | Part 2. Bar No. 7. Reversed. | | |
|---|---|---|---|---|---|
| Weight in tons. | Readings by Mic. Screw. | Deflections for each half ton. | Weight in tons. | Readings by Mic. Screw. | Deflections for each half ton. |
| No weight | .075 ? | | No weight | .025 | |
| .50 | .130 | | .50 | .054 | .029 |
| 1.0 | .153 | .023 | 1.0 | .092 | .038 |
| 1.5 | | .023 | 1.5 | .153 | .061 |
| 2.0 | .199 | .023 | 2.0 | .235 | .082 |
| 2.5 | .220 | .021 | Elasticity clearly injured by the former experiment. | | |
| 3.0 | 2.90 | .070 injur'd | | | |

It appears from these experiments, that both parts of the bar No. 5, (whose direct elasticity was 9.5 tons,) had their restoring power just preserved with a transverse strain of two and a half tons on a bearing length of thirty-three inches. Hence, in the formula:

$$d' = \frac{3\,l\,w}{4\,d\,a\,t}$$

we have $l = 33$, $w = 2\frac{1}{2}$, $d = 2$, $a = 2$, $t = 9.5$, and $d' = 1.62$ inches, depth of tension.

Consequently, $d'' = .38$ inches, depth of compression, and the ratio of the area of compression to tension, . 1 : 4.3

In the first part of Bar No. 6, $w$ is not quite 2 tons, and $t = 8.5$ tons; and hence the ratio, . . . 1 : 2.7

In the second part of the same bar, ditto . . 1 : 2.7

In the first, second, and third parts of Bar No. 7, $w = 2\frac{1}{2}$ tons, and $t = 10$ tons, . . . . 1 : 3.4

As far as these experiments are authority, therefore, the neutral axis divides the sectional area of a rectangular bar in about the ratio of one to three and a half.

In the following experiments, the iron was all supplied by Messrs. Gordon, and was of the same quality as the bar No. 7; its elasticity, may, therefore, be taken as ten tons, but it was not determined by testing, as in the preceding experiments.

## TABLE IV.

**Bar No. 8.**

| Distance of bearing. | Breadth. | Depth. | Weights. | Deflections. | Deflections each half ton. | Remarks. |
|---|---|---|---|---|---|---|
| inches. | inches. | inches. | tons. | | | |
| 33 | 1.9 | 2 | .125 | .034 | | |
| | | | .250 | .046 | | |
| | | | .500 | .060 | | |
| | | | 1.00 | missed | .019 | |
| | | | 1.50 | .098 | .019 | |
| | | | 2.00 | .120 | .022 | Mean .024 |
| | | | 2.25 | .134 | .028 | $w = 2.25$. Neutral |
| | | | 2.50 | .151 | .034 | axis, 1 : 3.4. |
| | | | 2.75 | .176 | .044 | Elas. inj'd with 2.50 T. |
| **Bar No. 9.** | | | | | | |
| 33 | 1.9 | 2 | .250 | .047 | | |
| | | | .500 | .055 | .016 | |
| | | | 1.00 | .077 | .022 | |
| | | | 1.50 | .097 | .020 | Mean ·021 |
| | | | 2.00 | .123 | .026 | |
| | | | 2.25 | .132 | .018 | |
| | | | 2.50 | .145 | .026 | $w = 2.25$. N. ax. 1 : 34 |
| | | | 2.75 | .164 | .038 | Elasticity inj'd with 2.50 |
| | | | 3.00 | .210 | .092 | Ditto destroyed with 3.00 |
| **Bar No. 10.** | | | | | | |
| 33 | 1.9 | 2 | .500 | .056 | | |
| | | | 1.00 | .076 | .020 | |
| | | | 1.50 | .095 | .019 | Mean .024 |
| | | | 2.00 | .124 | .029 | |
| | | | 2.50 | .151 | .027 | $w = 2.5$. N. ax. 1 : 4.2 |
| | | | 3.00 | | | |

*Deductions from the three last Experiments, confirmed by direct Observation of the place of the Neutral Axis.*

These experiments, like the former, imply, according to the formula, that the neutral axis lies at about one-fourth or one-fifth of the depth of the bar from its upper surface; but a method was adopted in these to discover, if possible, its position mechanically. With this view, a key-way, or groove, was cut in the side of the bar, one inch broad, and one-tenth of an inch deep; thus reducing the breadth to 1.9 inches. To this key-way, or groove, was fitted a steel key, which might be moved easily; and when the strain was on, the key was introduced, which it was expected would be stopped at the point where the compression commenced, and this was accordingly found to be the case in two out of the three bars, but not in the third, the fitting not being sufficiently accurate. The other two, however, showed obviously a contraction of the groove, at about half an inch

from the top, agreeing with the preceding computations. To make the results more certain, three other bars, exactly like the former, had deeper grooves cut, and the key more exactly fitted, and with these the results were as definite as could be desired. The key, as above stated, moved smoothly and easily before the experiment; but when two tons strain were put on, and the key applied, it was stopped, and stuck at a definite point. The strain being then relieved, the key fell out by its own weight; the strain was again put on, the key sticking as before; the strain being relieved, the key again fell, and so on, as often as repeated. Precisely the same happened with all the three bars. One of them was then reversed, so that the part which had been compressed was now extended, and exactly the same result followed; showing, most satisfactorily, that our former computed situation of the neutral axis was very approximative. The measurements obtained in these experiments being tension 1.6, compression .4, giving exactly the ratio of 1 to 4 in rectangular bars. These results seem the most positive of any hitherto obtained; still, there can be little doubt this ratio varies in iron of different qualities; but looking to the preceding experiments, it is probably always between 1 to 3, and 1 to 5.

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### *On the Stiffness of Rectangular Iron Bars, and their Deflections under different Weights.*

Although it is necessary to know the actual resisting power of bars in their ultimate state of strain, in order to determine the relative strengths of differently shaped bars, yet the question of most practical importance is, the stiffness they exhibit when loaded with smaller weights; for we ought never to strain a bar so nearly to its full power of bearing, as to make this the immediate subject of inquiry.

The experiments recorded in the last section are applicable to this purpose, but as these are all of the same depth, it was thought more satisfactory to make a few other experiments on bars of different breadths and depths. These are given in the following page. They were performed precisely like the last, and, therefore, require no particular description.

*Experiments on the Deflection of Malleable Iron Bars, under different Strains.*

**Bar No. 11.**

| Distance of bearings. | Breadth. | Depth. | Weight. | Deflections. | Deflections for each half ton. | Remarks. |
|---|---|---|---|---|---|---|
| inches. | inches. | inches. | tons. | | | |
| 33 | 1.5 | 3 | .125 | .043 | | |
| | | | .500 | .059 | | |
| | | | 1.00 | .074 | .015 | |
| | | | 1.50 | .083 | .009 | |
| | | | 2.00 | .095 | .012 | |
| | | | 2.50 | .101 | .006 | Mean .0103 |
| | | | 3.00 | .109 | .008 | |
| | | | 3.50 | .120 | .011 | |
| | | | 4.00 | .131 | .011 | $w = 4\frac{1}{2}$. N. ax. 1 : 4.9 |
| | | | 4.50 | .148 | .017 | Elas. pres'd at $4\frac{1}{2}$ tons. |
| **Bar No. 12.** | | | | | | |
| 33 | 1.5 | 3 | 0 | 0 | | |
| | | | .50 | .017 | | |
| | | | 1.00 | .037? | | |
| | | | 1.50 | .052 | .015 | |
| | | | 2.00 | .061 | .009 | |
| | | | 2.50 | .064 | .003 | Mean .0108 |
| | | | 3.00 | .078 | .014 | |
| | | | 3.50 | .089 | .011 | |
| | | | 4.00 | .102 | .013 | $w = 4\frac{1}{2}$. N. axis 1 : 4.9 |
| | | | 4.50 | .124 | .022 | Elasticity injured. |
| **Bar No. 13.** | | | | | | |
| 33 | 1.5 | 2.5 | 0 | .006 | | |
| | | | .50 | .003 | .024 | |
| | | | 1.00 | .050 | .020 | |
| | | | 1.50 | .060 | .010 | |
| | | | 2.00 | .074 | .014 | Mean .0173. |
| | | | 2.50 | .093 | .019 | |
| | | | 3.00 | .110 | .017 | $w = 3$. N. axis 1 : 4.9 |
| | | | 3.50 | .149 | | Elas. preserved, 3 tons. |
| | | | 7.5 | Bent 8 | inches. | |

To reduce the law of deflection from these results, we may have recourse to two well known and well established formulæ, viz:

$$\frac{l\,w}{4\,a\,d^2} = S \text{ and } \frac{l^3\,w}{a\,d^3\,\delta} = E,$$

which are both constant quantities for the same material, $w$ being the greatest weight the bar will bear, without injuring the elasticity; consequently, when $l$ is also the same in both, $d\,\delta$ will be also constant, $a$ being the breadth, $d$ the depth, and $\delta$ the deflection. That is, all rectangular bars having the same bearing, length, and loaded in their centre to the full extent of their elastic power, will be so deflected, that their deflection ($\delta$) being multiplied by their depth, ($d$,) the pro-

duct will be a constant quantity, whatever may be their breadths, or other dimensions, provided their lengths are the same.

Let us see how nearly our several results agree with this condition.

In the several bars, Nos. 8, 9, 10, 11, 12, 13, multiplying the mean deflection for each half ton, by the number of half tons which excited its whole elasticity, and this again by the depth of the bar, we find,—

| | Depth. |
|---|---|
| No. 8, ultimate deflection, . | .108×2 =.2160 |
| No. 9, . . . . | .094×2 =.1880 |
| No. 10, . . . . | .120×2 =.2400 |
| No. 11, . . . . | .0876×3 =.2628 |
| No. 12, . . . . | .0918×3 =.2754 |
| No. 13, . . . . | .1038×2½=.2595 |
| | 6 ) 1.4417 |
| Mean, | .2403 |

There is rather a large discrepance in bar No. 9; the others are as approximative to the mean as can be expected in such cases.

If we make the same trial on the three parts of bar No. 7, we have,

| | | | | |
|---|---|---|---|---|
| 1st part | .116 | × 2 | = | 2320 |
| 2d part | .105 | × 2 | = | .2100 |
| 3d part | .115 | × 2 | = | .2300 |
| | | | 3 ) | 6720 |
| Mean, . . | | | | .2240 |
| Former mean, . . | | | | .2403 |
| | | | 2 ) | .4647 |
| General mean, . . | | | | .2323 |

We may, therefore, say, that any malleable iron bar, of 33 inches bearing, being strained to its full elasticity, will be so deflected, that its depth, multiplied by the deflection due to 30 inches, will produce the decimal .23; consequently, $\frac{.23}{d}$ = the deflection, $d$ being the whole depth in inches.

In this form, however, it applies only to rectangular bars. To make it general, we must estimate it from the neutral axis, which in rectangular bars, being one-fifth of the depth below the upper surface, the above constant, when thus referred, becomes .2323 × $\frac{4}{5}$ = .1858. But, on the other hand, our instrument for measuring the deflection was but thirty inches long; it has, therefore, to be increased again in the ratio $30^2 : 33^2$, or as $10^2 : 11^2$, on this account; so that, ultimately, the formula is $d' \delta = .22$, $d'$ denoting now the depth of the bar below the neutral axis; and in this form it is general for parallel rails of any section whatever.

A curious circumstance was observed in these experiments, which, although it has no immediate bearing on the subject in question, it may be well to notice, and which is, I apprehend, characteristic of good malleable iron, viz: that the resistance to compression, although so much greater than the resistance to extension, is the first of the two which loses its restoring power; for, if we so far increased the strain as to overcome the elastic power, the point of compression descended to nearly the middle of the depth, proving that the tensile force, although so much less, is the most tenacious; whereas I suspect that in cast-iron it is the reverse, that is, it is here the tensile power which first yields, and the consequence is a sudden fracture, and momentary destruction of the bar.

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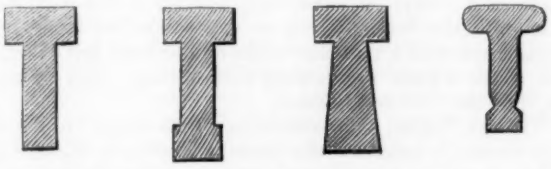
*On the Sectional Figure of Greatest Resistance, the Area being given.*

Having established the preceding data, I might now proceed directly to find, with a given sectional area, the figure of greatest resistance; but this would be of little advantage, for the form we should arrive at would be quite inapplicable to a railway, as it would require the metal to be principally collected in the lower table; whereas, in the railway bar, we must, of necessity, bestow a certain quantity, perhaps two-fifths of the whole, in forming the upper table on which the carriage runs; it is, therefore, only after this is provided for, that we are at liberty to dispose of the remaining part of the metal, and, even in this distribution, regard must still be had to practical convenience. Instead, therefore, of determining, mathematically, the area of maximum resistance, the most useful plan will be to compute, directly, the resistance of such sectional figures as fall within the limits of practical application, and to select from them that which, under all considerations, is the best.

The three forms of rails which, under this restriction, will have to be considered, are the following:

Fig. 1. Fig. 2. Fig. 3. Fig. 4.



1. The plain T shaped rail, fig. 1.
2. The H, or double T, formed rail, with a lower table, as fig. 2.
3. The Trapezoidal rail, as fig. 3.

Each of which will admit of various changes of proportions, without altering the general character of the section.

The upper and lower tables are here represented as rectangular, with sharp edges. In practice these are rounded off, the metal thus displaced furnishing a sort of bracket between the table and stem, or rib, as shown in fig. 4; but to treat of them in this form would intro-

duce great intricacy into the calculation, without much affecting the results. It will, therefore, be sufficient to consider them as rectilinear.

I would here observe, also, that some projectors have made the upper and lower tables of equal figure, upon the distant contingency, that when the upper table has been worn down, the rail may be turned, and the lower table made the upper. But this is certainly providing without foresight; for the bottom table is the most efficient for strength, and it would be a very dangerous experiment, after one side of a bar has been submitted for many years to a high compressing force, and its substance (by the hypothesis) greatly worn, to turn the rail, and expose this worn part to a still greater strain, but tensile instead of compressive, which could not fail instantly to destroy it. Instead of this, therefore, I should certainly recommend to work whatever metal is introduced into the lower table, or web, into that form which is most efficient for present purposes, without regard to the contingency alluded to above.

That the rail is deteriorated by exposure and wear, is undoubtedly true, although, perhaps, the amount is not yet well ascertained. Amongst the papers submitted to Messrs. Rastrick and Wood, with whom I was associated, we found it estimated at the rate of one-sixth of a pound per yard per annum; but I have since seen it stated, in a letter from Mr. Dixon to Mr. Bidder, at one-tenth of a pound per yard per annum. This was determined by taking up three rails, having them well cleaned and weighed, and then putting them in their places, and afterwards washing and reweighing them at the end of a twelvemonth, when two of them were found to have lost a half pound in weight for the five yards length, and the third three-fourths of a pound, which last was taken up from a particular situation, where it was more exposed to friction. But even this does not prove that the whole loss of weight is in the upper face of the rail; and if it did, it would be, as I have before observed, a stronger reason for not turning the rail; and, on the other hand, should the waste not be on the upper surface, the provision alluded to is unnecessary. Mr. Rastrick informs me, that even the small fins left at the meeting of the rolls are still quite distinctly seen on the face of the upper table; and Mr. Stephenson states, that the marks of the tools left in turning the flanches of the wheels are seldom obliterated; which proves, at all events, that there is no side wear.

Mr. George Bidder, who attributes all the waste to the wear on the upper surface, estimates the annual reduction at the one-ninetieth part of an inch; in which case, the rails would not last more than thirty years before they would require to be replaced. And it then becomes a question, whether, in point of economy, it would not be better to lay an additional third of an inch upon the upper table, which would, by this reckoning, make the rail last sixty years. This increase of one-third of an inch would call for an additional expense, to the amount of about $7\frac{1}{2}$ per cent. on the present cost; and this $7\frac{1}{2}$ per cent., at compound interest, would amount to about 30 per cent. in thirty years. If, therefore, a charge of 30 per cent., at the end of thirty years, would meet the amount of remanufacture, and supply

the waste, the two accounts would be about balanced. In this case, I must consider the latter as preferable. 1st. Because the other plan would increase the weight of the bar, and the difficulty of the manufacture, and probably diminish its soundness. 2d. Because thirty years' experience may introduce improvements, of which, at the end of that period, it would be desirable to take advantage. And, lastly, because I do not (judging from the opinion of different practical men,) think that it has yet been clearly determined what part of the waste is due to wear on the upper face.

To return again to the subject of the best formed section, I beg to repeat, that whatever figure the above, or other considerations, may lead practical men to adopt in the upper or lower table and rib, it will be fully sufficient, for the purposes of calculation, to consider them as rectilinear, which will greatly facilitate the investigation, without sensibly affecting the results.

[TO BE CONTINUED.]

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¶ *Description of the Freyburg Suspension Bridge.*

The city of Freyburg, in Switzerland, is well known to most travellers for its remarkable locality, being seated partly in a deep and winding valley, watered by the river Saone, and partly on the adjacent high and overhanging cliffs. To arrive at the centre of the town, by the road from Berne, carriages were formerly obliged to descend the steep declivity of the Staalberg. On arriving at Bernegate, it seemed to travellers as if they had already got to the end of their journey; but great was their astonishment to be informed that they had yet to travel for half an hour before they could reach the city, to follow the several large windings of the river, cross it three times, and then to ascend the long, difficult, and steep ascent, called *Alt Brunnen Strasse*, (Old Well street.) which was at all times enough of itself to dismay a traveller, and has proved the death of many a horse. The bad state of the roads, and defective plan of the streets leading to the centre of the city, increased the difficulty of approaching it. Industry, commerce, social life, all felt alike the influence of this almost isolated position of the place. But what could be done? The obstacles seemed insurmountable; the almost perpendicular cliffs on which the chief part of the town stands, seemed to mock the idea of forming a street through them of any tolerable degree of ascent; and had even this been possible, it would only have tended to increase the length of the windings. On the other hand, the idea of erecting a bridge, either of wood or stone, of a sufficient height to overcome the difficulty of the rugged ascents and descents, seemed too daring for contemplation, the height being upwards of 150 feet, and the length much greater. The expense, too, especially if stone had been employed, would have been out of all proportion to the means of the citizens; for the city is not rich, being but little frequented, and thinly populated, containing, exclusive of the suburbs, no more than 9,000 inhabitants.

Some of the more public spirited and zealous citizens, who had heard of the iron suspension bridges erected in other countries, at

length proposed to raise, by subscription, the pecuniary means necessary for ascertaining the applicability of such a structure to the natural circumstances of Freyburg, and, if practicable, of actually constructing it.

As soon as the subscription reached a suitable amount, several eminent engineers were consulted, and, after examination of the plans of different competitors, M. Chaley, the famous French engineer, who erected the wire bridges at Beaucaire, Chasey, and several other places in the south of France, obtained the preference. The contract agreed on with him, on the 10th of February, 1830, was to this effect: that he was to have, at different instalments, 200,000 (Swiss) francs, for the completion of an iron wire bridge; that the expense of the approaches on both sides, and the compensation to individuals for loss sustained in their property, should be defrayed partly by the subscribers, and partly by the government; and that the contractor, M. Chaley, subject to certain conditions, should have the enjoyment of the produce from the tolls for eighty years. Some time afterwards, these conditions were considerably modified, it being agreed that M. Chaley's right to the tolls should be limited to forty years, at the end of which time the profits are to revert to the subscribers during fifty-nine years, after which the toll is to cease, and the bridge to become the property of the canton, or common property.

The first general meeting of the subscribers took place on the 19th of March, 1830, when they appointed a committee of ten members, (afterwards increased to twenty,) to superintend the erection of the bridge.

Immediately after these arrangements, the necessary preliminary preparations were entered upon; but the political disturbances which broke out, in 1830-1, in France, and afterwards in Switzerland, but particularly in the canton of Freyburg, had a most injurious influence on the undertaking; added to which, differences arose between the contractor and the committee, which tended greatly to retard the project. The general good will of the citizens, however, and the indefatigable zeal and activity of some of the leading members of the committee, recalled ere long the dormant project into activity. In March, 1832, the works were entered upon with great zeal, and the first stone of one of the porticos was laid under the superintendence of the architects Kraser and Brugger. From that time, the works were continued in every department without interruption, and, to facilitate their progress, a temporary bridge was thrown over the river Saone, it being for the ease and advantage of the workmen to get from one side to the other without loss of time.

The finances of the company were all expended, however, long before the bridge approached to its completion. But, though the funds were exhausted, the ardour and generous feeling of the subscribers and donors were not. Government, which, from the beginning, had given its particular sanction and protection to the measure, came once more to its assistance, by granting leave for the opening of a lottery, which produced to the company the sum of 80,000 francs.

The work was now once more renewed with vigour, and on the

9th of June, 1834, the subscribers had the gratification of seeing extended across the valley, the first of the numerous wires which form the two main ropes, or supports, of the bridge. Next followed the fixing of the subordinate suspension wires, and the laying down of the beams to form the foundation, or flooring, of the bridge. The latter mentioned operation took place, it might be said, in a magical manner. The inhabitants were not a little surprised to find at their gates an unlooked-for, and, for foot passengers, a sufficiently solid, bridge, where, ten days before, they had seen only two immense wire ropes. After this, the other various inferior works soon followed, as the completion of the footway, the erection of the balustrade, &c. At length, on the 8th of October, a carriage was driven over the bridge at full gallop, which was followed, on the same day, by the stage, or post-coach, from Berne to Freyburg, enthusiastically greeted by a vast number of astonished spectators.

The balustrades, though simply modelled, present, nevertheless, a very handsome appearance. Any vehicle, be it ever so heavily laden, may safely venture over; and although the ear is at first rather startled at the noise of the trampling of horses, yet the most clear-sighted person cannot discover the slightest motion communicated either to the wire ropes, or to any other part of the bridge. The traveller passing over does not feel the least vibration, and his astonishment finds no bounds, to think that he has arrived so soon, and in safety, across the deep gulf below.

As has been before observed, the whole structure is suspended by two large *ropes of wire*, firmly secured at each end, by being let into shafts made for that purpose. At each end, the porticos over which the ropes pass, serve for *antagonist supporters*, or counterforts. They are built partly of limestone, brought from Neuenberg and Neuenstadt, and partly of sand-stone, which is got in the stone quarries in the neighbourhood of Freyburg; all the blocks are, by way of greater security, connected with each other by means of iron cramps. The quantity of iron used for this purpose, was 570 cwt. The height of the porticos is 65 Berne feet. The opening for the gateway is 45 feet high, 20 feet wide, and 19 feet in depth; the width of each pillar is 14 feet. About 160 feet from the porticos, the shafts are situated; their depths are each 58 feet, and their diameters 32 feet. These shafts are hewn out of the rock on both sides, and comprise each three chambers, situated at a certain distance from each other, each containing three immense unwrought blocks of Neuenberg stone, to which the *main wire ropes* are fastened. The connecting wires, or chains, sixteen in number, are drawn through these vaults; they rest at the same time on twelve cast-iron cylinders, and are held fast by 128 anchors, or grapples, of a total weight of 1,024 pounds. These connecting ropes, or ties, serve the great main wire ropes as auxiliary supports, which bear up on both sides the great beams of the bridge flooring, by means of suspension wires, or ties. The length of the main wire ropes is 1,280 feet each; they consist each of 2,000 separate wire threads, which, united, make a mass of 4,000

threads, or little chains, of a total weight of 960 cwt. Dependent from each of the two main connecting wire ropes, or inverted arch, hang 164 smaller suspension wire ropes, at about five feet asunder; these are made fast above through iron loops, and below are connected with hoops of iron, into which the beam ends which support the footway are firmly fastened. The longest of the smaller dependent ropes of wire is sixty feet, and the shortest half a foot; each is composed of twenty-five single wires, so that the roadway of the bridge is held up by more than 8,000 single wires. The number of beams which form the foundation, or platform, of the bridge, amounts to 166, held together by 328 hoops of wrought iron. Four lines of beams run longitudinally throughout the whole length of the bridge, upon which rest the two footways. On both sides, to separate the carriage way from the footpaths, are strong oaken balustrades, made in the form of St. Andrew's cross, the height of which is four feet. The carriage way is sixteen feet, and each footway three feet wide; so that the total width of the bridge is twenty-two feet. Its total length, including the two counterforts, over which the main wire ropes are passed, is 941 feet; exclusive of the counterforts, its length is 903 feet; the carriage way alone is 864 feet. Its height above the river, when measured, 30th of October, 1834, was 163 feet.

The quantity of iron used in this work, was not less than 80 tons, and of wood, 135 tons.

The weight sustained by the two main wire stays is 120 tons, and it is calculated to sustain the amazing and enormous weight of 2,400 tons. [*Lond. Mech. Mag.*

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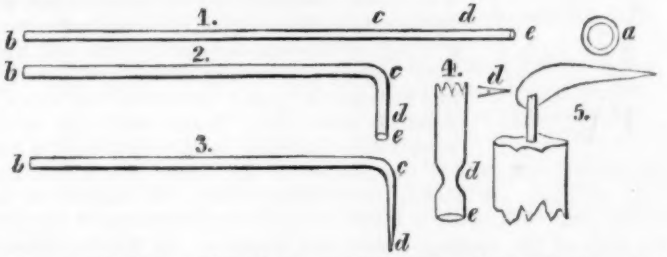
### ¶ *On the Practice of the Blow Pipe.*

The introduction of the use of the blow pipe in practical chemistry, may be regarded almost in the same light as the application of the power of steam to the purposes of commerce. If the latter has increased our national resources, and forwarded the interests of mechanical science, by economising the labour and expenditure which were formerly bestowed, the former has, in like manner, advanced the cause of chemistry, and its dependent sciences, by reducing the expense of fuel, time, and material, which were originally required in qualitative analysis. If the mechanic can now produce, with comparative ease and expenditure, an article which, before the introduction of the steam engine, would have required the labour of many weary days, and the consumption of much valuable material,—the modern chemist can, with equal facility, detect the constituent principles of a body, which, before the invention of the blow pipe, would have called in requisition the unremitting exertions of many tedious nights, and the profuse employment of many rare, and, perhaps, valuable substances. In fact, by the introduction of this simple, yet invaluable instrument, the modern chemist can, by his parlour fireside, and with a common candle, perform those operations, to accomplish which, the ancient and less gifted philosopher would have been compelled to resort to the unhealthy atmosphere of a laboratory, and the continued poring over an intensely active fire. The blow pipe,

according to Bergman, had been long employed in the arts by jewellers and others, for the purpose of soldering, before it was applied to the purposes of analytical chemistry and mineralogy, by a Swedish metallurgist, of the name of Sual, about the year 1733. This individual, however, appears to have left no written account of the method which he adopted in the application of this instrument. The researches of Cronstedt, Bergman, and Gahn, and, more recently, those of Berzelius and Faraday, have concurred in raising this instrument to the eminent station of utility which it at present enjoys. In the work of Berzelius on this subject, will be found ample instructions for the pursuit of mineralogical and analytical chemistry; and in the "Chemical Manipulations" of Dr. Faraday, the student will meet with copious directions for applying this instrument in the bending and blowing of glass, in practical chemistry. For the former purpose, the mouth blow pipe possesses undeniable advantages; but for the more fatiguing operations of the latter, the table, or hydrostatic, blow pipe will be found convenient. The advantages possessed by the mouth blow pipe over all those instruments whose blast is produced by artificial means, consists in its portability, economy, and the facility of immediately suspending or modifying the blast. "The chemist does not possess," says Dr. Faraday, "a more ready, powerful, and generally useful instrument, than the mouth blow pipe, and every student should early accustom himself to its effectual use and application."




The supply of a *continued* stream of air, is the chief difficulty which a beginner experiences in learning the use of this instrument, and this difficulty is, I apprehend, not unfrequently increased by the employment of a blow pipe with too large an orifice, in the first instance. The following method of constructing, will, I have reason to believe, be found more efficacious than any other hitherto published, since I have, by its means, succeeded, in less than half an hour, in communicating the art of blowing to a class of several persons. Let the pupil procure a tube of glass, *b e*, about thirteen inches long, and of the size and thickness of *a*. Let him now thoroughly heat the tube at *c*, about two inches from the end, by slowly turning it round in the flame of a candle, or, what is better, a spirit lamp. When he finds that it will yield, let him bend it gradually till it has acquired the position represented by fig. 2. The part *d* is now to be heated in the same manner, till it is found soft enough to draw out, when the part *e* must be gradually withdrawn, as represented in fig. 4, till it terminates in a

point; this point should be held for a minute or two in the point of the flame, in order to thicken it, and when cold it is to be ground away with a file, until the smallest possible orifice is visible. The pupil will now be possessed of a blow pipe (fig. 3) with an exceedingly minute jet; and if he puff out his cheeks to the utmost, and place the end *b* within his lips, while the other extremity is held within a short distance of a candle, (fig. 5,) he will, after a few trials, find no difficulty in keeping the flame *continually*, and *without intermission*, horizontal and clear. The operation which he will be required to perform, in order to keep his cheeks constantly distended, notwithstanding the escape from the jet, cannot easily be described, but will naturally offer itself when the expenditure of air is very small. When the pupil has succeeded in keeping up a constant blast for several minutes, by this means, he may enlarge the aperture by degrees, practising between each enlargement, till he finds he can manage a blow pipe with a large bore, when he should purchase one of brass, with an ivory or tinned mouth-piece, for general use.

Among the numerous hydrostatic blow pipes which have already appeared in your Magazine, the pupil who wishes to manufacture his own apparatus, may assuredly find one which will form a substitute for the table blow pipe. I subjoin a plan for one, which may be constructed, at a trifling expense, by almost every student, and in situations where the articles or workmanship requisite for the construction of a more complicated machine, could not be procured. *a b* (fig. 6) is a common pail, about half filled with water; *c* is a large flower pot, inserted, and fastened in by any convenient method; *d* is a mouth blow pipe, (glass would do on an emergency,) fastened in air-tight, with a cork and lute, to the hole at the bottom of the flower pot; *e* is a bent tube of glass, or metal, terminating under the mouth of the flower pot. When air is blown in from the mouth at *e*, it rises into the body of the internal vessel, and displaces the water, which, in endeavouring to regain its level, forces out the air from the jet of the blow pipe, with a force proportioned to the height of the column of water displaced. [*Lond. Mech. Mag.*

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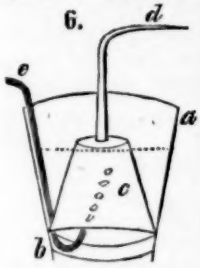


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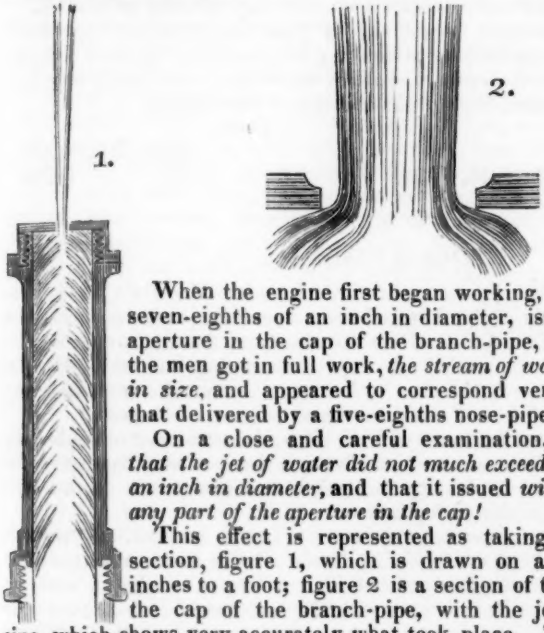
¶ *Singular Hydraulic Phenomenon.*

"The motion of fluids, and the friction and other causes by which it is impeded, forms one of the most elaborate and abstruse branches of mathematical philosophy."—*Prof. Millington.*

While some comparative trials were being made between some engines belonging to the London Fire Establishment, opportunity was taken of ascertaining the effect of a short cylindrical branch-pipe, which consisted of a straight metal cylinder, twelve inches long, closed at the top by a flat brass cap, having a circular opening in its centre, seven-eighths of an inch in diameter. Previous to the

employment of this kind of branch-pipe, I had foretold an unfavourable result, from the interference of opposing currents, but must confess I was by no means prepared for what followed, which was of so extraordinary a nature as to surprise all the persons who witnessed the phenomenon.




When the engine first began working, a jet of water, seven-eighths of an inch in diameter, issued from the aperture in the cap of the branch-pipe, but as soon as the men got in full work, *the stream of water diminished in size*, and appeared to correspond very nearly with that delivered by a five-eighths nose-pipe.

On a close and careful examination, it was found *that the jet of water did not much exceed five-eighths of an inch in diameter*, and that it issued *without touching any part of the aperture in the cap!*

This effect is represented as taking place in the section, figure 1, which is drawn on a scale of two inches to a foot; figure 2 is a section of the aperture in the cap of the branch-pipe, with the jet of the full size, which shows very accurately what took place. The stream of water appeared to be very much pinched all round; it presented a somewhat irregular surface, and was very much divided at the end of its range.

In fig. 1, I have endeavoured to represent the currents which would appear to be concerned in producing this singular effect; it seems as if the particles of water striking against the flat surface of the cap, were deflected towards the orifice from all sides, and pinched the jet, so as to cause the contraction that was observed to take place.

In using branch-pipes of the usual taper form, when particles of air escape with the jet of water from the nose-pipe, a loud *popping* sound is always produced; but with the cylindrical branch, the noise in such case produced was strikingly different, being a *sharp cracking, or snapping, sound.*

Apparatus of a similar kind to the above has been tried before, but the singular phenomenon I have described appears to have escaped observation.

The issue of fluids from apertures of various kinds, under the influence of gravitation alone, with the nature of the currents supposed

to exist, have been investigated by Newton, Bernoulli, Venturi, and many others; but the nature and properties of jets urged by great pressure, does not appear to have occupied much attention.

This subject offers a wide field for investigation; I shall avail myself of the occasional opportunities kindly afforded me of examining this matter, and communicate such new facts as may be elicited.

In the meantime, should any of your numerous correspondents have had the opportunity of noticing any facts bearing upon this particular branch of science, I shall be most happy to be made acquainted with the same, through the medium of your pages.

Yours,

WM. BADDELEY.

*London, March* 18, 1835. [*Ibid.*

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¶*Patent Bronze Sheathing.*

There has been delivered this week to his Majesty's Dock-Yard here, a quantity of the *Patent bronze Sheathing*, and directions have been given by the Lords of the Admiralty to sheathe two of the Falmouth packets that may next require coppering, one side with the patent bronze, and the other with copper, so that a comparison may be fairly established of the duration of the two substances.

We have been favoured with an inspection of a sheet of the bronze, and certainly it is a most beautiful specimen of manufacture. But notwithstanding its density and polished surface, it is at the same time quite malleable and pliant.

The subject, we are aware, is one of great interest, and we have therefore collected the following details relative to this new invention, which we understand originated with a French engineer, and was first tried in the French navy in 1829; since which, on account of its superior durability, ascertained by repeated experiments, the French government has contracted for several hundred tons a year. In every instance it has been found to keep quite *clean*, a point of paramount importance, whilst from its superior hardness, it is not so liable to be rubbed in case of a vessel taking the ground or running foul.

The durability of ancient bronze coins, medals, and utensils, has long excited attention; numerous specimens are found in Egypt, Greece, and Italy. The famous horses of St. Mark, at Venice, are a remarkable instance of preservation; but it was never thought practicable to render such a hard and dense metal malleable so as to convert it into sheets. The beautiful specimen we have seen, proves that this difficulty has been at last overcome.

We are informed that the usual composition of the bronze of antiquity, was copper combined with six to ten per cent. of tin. Bronze is in fact copper hardened, and rendered less liable to oxidation, by the addition of tin.

The wear of copper on ship's bottoms is a mechanico chemical action, inasmuch as its waste at sea is six and a half times greater than in harbour. We should conclude, therefore, *a priori*, that a hard

metal, like bronze, would waste less by the friction of the water, than a soft metal, like copper; and the greater duration of ancient bronze, proves that it is less oxidable. There would thus be established a superiority in resisting mechanical as well as chemical action in favour of the bronze. The result of the experiments made in the French navy on bronze sheathing, *very imperfectly manufactured*, as stated in the "Annales Maritimes" for 1830, '31, and '32, goes to prove that when applied to ships' bottoms, the loss in weight of the bronze is less than half that of copper.

It appears now established, that a continued and necessary wasting of the metallic sheets alone secures a clean bottom, and that no galvanic protection is compatible with it, fresh surfaces of the metallic sheets must constantly be presented by the washing away of the scale or oxide; every thing that attaches to the bottom in calms or in harbour, whether seeds of marine plants, or spawn of animalculae, is thus undermined and carried off, leaving the sheathing bright and clean. With the bronze, as with copper, the same continuous wasting is going on, but *with one half of the loss in weight*, owing to its greater hardness and density, and its inferior oxidability. Lead, zinc, etc. foul on ships' bottoms, not because their oxides are less poisonous than that of copper, but because, instead of being washed off, their oxides are *adhesive*, and eat, (if we may so express ourselves,) into the sheets, thus allowing whatever fastens on the bottom to remain there and increase. Sir H. Davy's protected copper failed for the same reason—there was no oxide formed, the copper did not waste at all, and thus became foul.

There is, however, one obstacle, to the general use of bronze which those who like cheap articles will hardly get over, namely it is 2d per lb. dearer than copper, which the English patentees, Messrs. Vivian & Sons, state they are obliged to charge to cover the great extra expense of rolling so hard and dense a metal into sheets, and the patent right; but we apprehend, if on trial the bronze, instead of giving double the wear of copper, gives only one half more, or as four years and a half to three years, this additional first cost will be trebly repaid to the ship-owner, as nothing is so vexatious and expensive as putting a ship into dock to get her re-coppered, when she does not require other extensive repairs. On whaling, and other distant foreign voyages, the longer duration of sheathing is a great desideratum. Even the first outlay may be eventually reduced by the use of bronze sheets eighteen or twenty ounces to the foot, instead of copper sheets of twenty-eight or thirty ounces per square foot.

Nearly the whole of the whaling and India ships from Havre are sheathed with bronze, and several have returned from these long voyages with their bottoms perfectly clean, and the sheathing very little worn. It is now extensively in trial on ships from London, Liverpool, Greenock, etc., so that the results obtained in France will soon be severely tested in this country.

We find we have omitted to notice a point of great importance in the sheathing for ships' bottoms, which is, that the wear should be uniform over the whole surface of the sheets. It is well known that

copper sheathing is greatly subject to be corroded into holes, and this especially happens when a vessel has been for some time in ordinary at her moorings, so that the sheathing often becomes unserviceable from this cause, although its total loss in weight is very small. This occurred in two instances in the trials made by the French navy, where one side was covered with copper and the other with bronze. Although the vessels had not been out of harbour, they were obliged to take off a considerable part of the copper, whilst the bronze sheathing was quite perfect, having worn uniformly over the whole surface.—*Plymouth Herald.* [*U. S. Mil. & Nav. Mag.*

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¶ *Extracts from a Lecture on the Preservation of Timber by Kyan's Patent for preventing Dry Rot: delivered by Doctor* Birkbeck, *at the Society of Arts, Adelphi; December* 9, 1834.

We have heard persons assert that it appears to them almost ridiculous to suppose that it ever can become necessary, on a large scale, to perform any operation with a view to render timber durable, beyond that of properly seasoning it by exposure to the atmosphere. But is not this mere prejudice? Why should not timber be prepared by a particular process, which conveys something additional into it, and thereby effects a chemical change in its nature, as well as leather is tanned?

"A very effectual procedure has taken place, in regard to one form of animal matter, by the preservation of the skin from natural decay in a process known by the name of 'Tanning.' This process will give a very good idea of Mr. Kyan's invention. Tanning consists in protecting the leather and skin by the introduction of tannin, which is generally derived from an infusion or decoction of the bark of the oak. If no change were produced in the gelatine, which makes the largest part of the skin to be immersed in the tan-pit, it would undergo certain chemical changes—it would putrefy, and lose its tenacity; but if a portion of animal jelly is dissolved in water, and a little of the substance added, similar to the tannin, a combination will take place between the gelatine; a precipitate will follow of the animal matter, which is the tanno-gelatine, or a compound of tannin and gelatine, and is precisely that substance which is formed in the leather, and gives to it durability and power to resist the causes of decay. The same intention exists in the process of Mr. Kyan. It is true he does not act on the gelatine of animal matter, but he does on the albumen: one of the approximate principles of vegetable matter, which appears to have been slightly perceived by Fourcroy, but which was actually discovered by Berzelius, about the year 1813.

"In order to obtain this vegetable matter (*albumen,*) there are various substances which may be employed. The Hibiscus esculentus yields it in considerable abundance: it is a West Indian plant, which Dr. Clarke mentions as adopted in Demerara, for the same purpose, as, in other Islands, the white of eggs and blood are employed in the process of clarifying sugar. The ficus indica, also, if divided at the stem, will exude a considerable quantity of this matter. If the solution of

the bichloride of mercury (which is the agent adopted by Mr. Kyan) is added to the vegetable matter, albumen, it will be found, when they come in contact, that decomposition occurs."

"Mr. Kyan, who had been a series of years (since 1812) engaged in trying a variety of experiments on the preservation of timber, was led to the present experiment by having, as he conceived, at length ascertained that *albumen* was the primary cause of putrefactive fermentation, and subsequently of the decomposition of vegetable matter. Aware of the established affinity of corrosive sublimate for this material, he applied that substance to solutions of vegetable matter, both acetous and saccharine, on which he was then operating, and in which albumen was a constituent, with a view to preserve them in a quiescent and incorruptible state, and obtaining a confirmation of his opinions by the fact that, during a period of three years, the acetous solution openly exposed to atmospheric air had not become putrid, nor had the saccharine decoction yielded to the vinous or acetous stages of fermentation, but were in a high state of preservation; he concluded that corrosive sublimate, by combination with albumen, was a protection against the natural changes of vegetable matter."

"The mode in which the application of the solution takes place, is in a tank similar to the model on the table. They are constructed of different dimensions, from 20 to 80 feet in length, 6 to 10 in breadth, and 3 to 8 in depth. The timber to be prepared is placed in the tank, and secured by a cross beam to prevent its rising to the surface.—The wood being thus secured, the solution is then admitted from the cistern above, and for a time all remains perfectly still. In the course of 10 or 12 hours the water is thrown into great agitation by the effervescence, occasioned by the expulsion of the air fixed in the wood, by the force with which the fluid is drawn in by chemical affinity, and by the escape of that portion of the chlorine or muriatic acid gas which is disengaged during the process. In the course of 12 hours this commotion ceases, and in the space of 7 to 14 days (varying according to the diameter of the wood) the change is complete, so that as the corrosive sublimate is not an expensive article, the albumen may be converted into an indecomposable substance at a very moderate rate."

After stating the result of various experiments, Dr. Birkbeck concludes by observing that this discovery is yet in embryo, but that the public benefit that will result from it is beyond calculation. In an *Appendix* the various purposes to which the process is applicable are detailed: such as preventing dry rot, seasoning timber, protecting from insects, applying the process to Canada and British timber, and preserving canvass, cordage, &c. from mildew.

"Canada timber is much more liable to decay than that grown in the northern parts of Europe, and for this reason is never used in buildings of a superior description. The principle of decay being destroyed, as above shown, this objection is no longer in existence; and this kind of timber may now be employed with as great security as that of a superior quality and higher price.

"The same observation applies with great force to timber of Bri-

tish growth, particularly to that of Scotland, much of which is at present considered of very little, if any value for durable purposes, on account of its extreme liability to decay, whether in exposed situations or otherwise. The present process will therefore render of considerable value, plantations of larch, firs of all kinds, birch, beech, elm, ash, poplar, &c., which are the chief products of the great wooded estates, and which, when prepared, may be advantageously employed to most useful purposes."

"*Purposes for which the Prepared Timber, &c., would be highly useful.*—Houses, farm-houses, out-houses. Large timbers, floors, roofs, gutters, &c., furniture, and all joiner's work, preserved from dry rot, and perfectly seasoned. Posts, rails, gates, park paling, fences, hop-poles, felloes, spokes, shafts, &c. &c. For these purposes any kind of timber may now be used, instead of the more expensive kinds. It will also supersede, in many cases, the employment of iron, from its acquired durability and greater economy."

The additional expense of preparing timber for buildings, such as farm-houses, out-houses, &c. in Mr. Kyan's manner is estimated at the very moderate sum of 20s. per load. [*Arch. Mag.*

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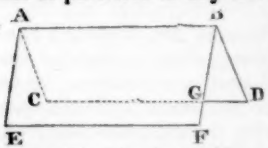
¶ *On the Resistance of Fluids; by* Geo. W. Keely, *Prof. of Natural Philosophy, in Waterville College.*

Sir:

I perceive in No. 55 of the Journal, that Prof. Wallace has announced a new measure of the resistance of a fluid in a direction perpendicular to a plane surface moving in it: viz. That it is as the sine of the inclination of the plane. Permit me to state my reasons for adhering to the old doctrine, that the perpendicular resistance is as the square of the sine of inclination. It is well known that the latter measure has been deduced from the alleged facts that the *number* and the *force* of the resisting particles vary as the sine of the inclination. If it be true that the resistance to a plane surface moving in a fluid is as the number of particles it strikes in its course, and that the number of particles in any indefinitely thin fluid lamina is as the area of that lamina, (neither of which we think Prof. W. will deny,) it follows that, if BD be a section of a plane inclined to the direction BA of its motion, and BF an equal section of an equal plane perpendicular to the same direction, the number of particles BD will strike is to the number that BF will strike in the same time, as the parallelogram ABCD is to the parallelogram AEFB; and the resistances are therefore, on this account, as BG is to BD, or as the sines of the inclinations of the sections; the resistances to the planes are of course in the same ratio.




Now this familiar demonstration would seem to settle the question; but Prof. Wallace argues, "that the number of particles striking the plane does *not* depend on the breadth of the fluid column BG BF, but *on the surface of the plane*, because the particles that act on the plane

are those in contact with it, and therefore their number is as its superficial area." Now admitting it to be true that the number of material particles in contact with the plane, at any instant, is the same, whether it be perpendicular or inclined to the direction of the motion, it does not, we think, necessarily follow that the number of particles struck in any given time will be the same. But neither is it evident that the number of particles in contact with the plane is the same for every inclination of the plane. The burden of proof, however, seems to lie with Prof. W. He has *assumed* the general physical fact that the number of particles in contact with the plane, at any instant, is the same for any position of the plane, and he has deduced an inference, not formally expressed, indeed, but surely implied, otherwise the argument is worth nothing, that the number of particles struck in any given time is as the number in contact with the plane at any instant. Now we think the fact and conclusion may very safely be denied, and it becomes Prof. W. to shew that they are consistent with some hypothesis respecting the form and relative position of the ultimate particles of a fluid body. In any hypothesis, we believe the following positions will be found to hold:

First. Whether the number of particles, at any instant, in contact with the plane, in different positions, is the same, depends wholly on the hypothesis.

Second. If the number is the same in different positions, it will be found that the number of fluid strata struck in any given time is as the sine of the inclination.

Third. If the number is *not* the same, then it varies as the sine of the inclination, and the number of strata struck will, in any given time, be the same.

If Prof. W. can devise any hypothesis with which these positions do not agree, we will allow he can disturb our belief in the truth of the law of the square of the sines.

The wide difference between the results of observation and those of the old theory, would tend rather to dissuade us from admitting the truth of the new, when we consider what important physical circumstances are and must be omitted in the conditions.—*Silliman's. Jour.*

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¶ *The Bleaching Mania; from a Lecture delivered before the Chelmsford Mechanics' Institute. By* John Murray, Esq. F. S. A., &c.

Chlorine (from a Greek word signifying green) is the characteristic name given to a gas discovered by Scheele, in 1774, and called by him *dephlogisticated marine acid gas.* It was some time ago more generally known by the name of oxymuriatic acid gas, from a presumption (now considered to be erroneous) that it contained oxygen; and among manufacturers it goes by the name of the bleaching gas. The mode of obtaining it is very simple. We take black oxide of manganese and mix it with a small portion of muriatic acid, in a glass retort, and on the application of heat the chlorine is evolved. Either alone, or in combination with lime or magnesia, it may be, and is, employed for bleaching paper. I have no objection to its being used

by the manufacturer in bleaching his linen and calico, but against the practice of bleaching paper I do protest. The consequences of thus using chlorine—which has the property of destroying ink and other colours—are, that many valuable epistles become illegible, and some have even dropped to pieces on the road. Some of our best modern books are already tottering on their shelves; and numerous deeds and valuable writings, requiring to be kept a great number of years, will, ere a very few, become useless. I have in my possession the remnant of a royal octavo volume, one of an edition of 30,000 copies, printed at the University press in 1818, and it is a singular fact, that there is not a perfect copy now existing. We find that when any thing of a delicate colour is wrapped up in white paper the colour is destroyed. A silk manufacturer once told me he could not perserve his coloured silks; he used the whitest and cleanest paper he could procure to wrap them in, but the colours invariably faded, I told him for the future to wrap them in common coloured, or brown, paper—he did so, and the silks retained their delicate hues. Paper stainers have lost hundreds of pounds in value, in consequence of the destruction of their goods by chlorine. This gas has also the property of dissolving gold. I knew a button merchant, who sent a quantity of gilt button to London for sale; being an expensive article, he took care to have them securely packed in white paper that they might be kept perfectly clean. The consequence was that the gilt corroded, and the buttons were returned unsaleable. Every thing now-a-days—such is the rage for bleaching—must be bleached. Our linen must be bleached, though by that means we render it yellow; our calico must be bleached; our ginger must be bleached, although at the expense of destroying the very principle which renders it valuable; and by-and-bye, I suppose, we shall be bleaching our daily bread. Let us, however, view the case as we ought. If we have an inferior article, paper for instance, the fault is ours, not the paper makers.

We fix our prices, and if I am determined to have a quire of paper for 4d. the manufacturer knowing he cannot furnish it of sterling quality, is obliged to resort to the expedient of bleaching, for the purpose of giving a good exterior to a bad material. Perhaps the subject may be illustrated this way: Suppose I want a pound of confectionary, I walk into the confectioner's, and say, "if you let me have it for 4d. I'll take it, and if not, why I can obtain it elsewhere;" never, for a moment, recollecting that the very materials, or perhaps merely the sugar, costs double the sum. The consequence of this mode of proceeding is, that we have the privilege of swallowing with our confectionary a sufficient quantity of chalk. To such a pitch has the bleaching of paper been carried, that Government find themselves obliged to employ a person to watch the manufacture of the paper they require, for the purpose of securing it of a good quality. I know of two cases in which letters containing money have fallen to pieces by the road. One was directed to the post master of Sheffield, and it so happened that the check was found in the post bag—the person for whom the other letter was intended, was not so fortunate. Every

thing is now made up into paper, and in consequence of its being bleached, we do not so easily detect the inferiority. I have by me specimens of paper made not only from wool and leather, but from the bark of the willow, from hay and straw, potato peelings, wood shavings, saw dust, and in short, any thing can be made into paper, *such as it is.* [*Lon. Mech. Mag.*

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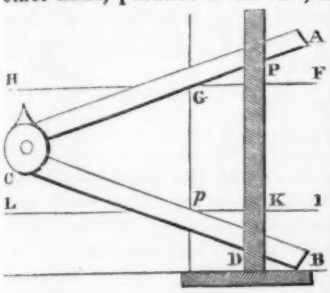
¶ *Simple Perspective Delineator.*

Sir,—It is a considerable time since I discovered, and reduced to practice, a ready method of putting plans into perspective, without drawing the usual lines, without finding vanishing points, and without any other trouble than using a very simple instrument with a little care. The following is a representation of the instrument, which is cheap, and is sold by the author.

Let A C B be a variable angle, to move in every position; H F a line for the plane of the picture; and L I a ground line parallel to it; other lines, parallel to the last, may be drawn for different elevations.




Let P be any point whose perspective is required; place C A at P, and also a T square, whose side is P D; this done, move the leg C B until the line, I K, falls in the angle P K B; now move the T square into the position G *p*, so that the line G F comes into the angle A G *p*; then the point *p*, so found, will be the perspective of P. The principle upon which the instrument is constructed is, that the elements of perspective depend solely upon similar triangles.

In the year 1821, I invented and made public that description of horizontal perspective called by me the Horizontorium. The demand for it was such that it was sent for from all parts, and continued in request for four years. Very recently, this very invention has been reproduced by persons who would fain persuade the public that it has just come from France. Some have done even worse than this, for they have published new ones on false principles, and painted them in a manner which is a disgrace to science; any person desirous of seeing a specimen of this has only to look in at the Pantheon, in Oxford street. The horizontorium has nothing beyond common about it; the only peculiarity being that the view is projected on a horizontal plane, in lieu of a vertical one. One eye only should view the picture, and that eye be guided by a hole in a card. The same should be done in viewing every perspective representation, let its plane of projection be what it may. I am, &c.

W. Shires.

[*Ibid.*

### ¶ *Mode of Preserving Milk for Long Voyages.*

Provide a quantity of pint or quart bottles, (new ones are perhaps best;) they must be perfectly sweet and clean, and very dry, before they are made use of. Instead of drawing the milk from the cow into the pail, as usual, it is to be milked into the bottles. As soon as any of them are filled sufficiently, they should be immediately well corked with the very best cork, in order to keep out the external air, and fastened tight with packthread, or wire, as the corks in bottles which contain cider generally are. Then, on the bottom of an iron or copper boiler, spread a little straw; on that lay a row of the bottles filled with milk, with some straw between each, to prevent them from breaking, and so on alternately, until the boiler has a sufficient quantity; then fill it up with cold water; heat the water gradually until it begins to boil, and as soon as that is perceivable, draw the fire. The bottles must remain undisturbed in the boiler, until they are quite cool; then take them out, and afterwards pack them in hampers, either with straw or sawdust, and stow them in the coolest part of the ship. Milk preserved in this way has been taken to the West Indies and back, and, at the end of that time, was as sweet as when first drawn from the cow. [*Ibid.*

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### ¶ *New Metallic Cement.*

A new metallic cement, for which a patent has been taken out, consists of powdered scoria from the copper works, mixed with stone and lime. It sets rapidly, and takes a fine metallic polish. It is now being used by Messrs. Harrison, in a large building intended for an inn, at the south-west corner of London Bridge. This cement, unlike all other kinds except Frost's, is sold mixed up ready for use. The price is 9*d.* per bushel. If the scoria, in a state of powder, were sold by itself compressed in casks, it appears to us that it would form a very desirable cement for exportation. It may be laid on in coats as thin as the fourth of an inch, but it has not been a sufficiently long time in use to determine to what extent it will crack.

[*Ibid.*

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### *List of American Patents which issued in June*, 1835.—(*Continued.*)

*June*

379. *Loom for figured work.*—E. Meily, Jr. and J. & S. Mellinger, Lebanon, Pennsylvania, . . . . . 26
380. *Saddles.*—A. L. Vanhorn, Philadelphia, 26
381. *Hulling clover, &c.*—John Whiteman, Philadelphia, 26
382. *Rotary steam engine.*—Charles Hill, Zanesville, Ohio, 26
383. *Ever-pointed pencils.*—Elwood Mears, Philadelphia, 26
384. *Churns.*—Isaac Wood, Connersville, Indiana, 26
385. *Mills for grain, &c.*—William S. Johnson, city of New York, 26
386. *Corn planting machine.*—Thomas D. Burrall, Geneva, New York, 26

387. *Roofs, metallic.*—John Bonis, city of Baltimore, 26
388. *Flask for casting kettles, &c.*—David Stewart, Danville, Pa. 26

## *List of American Patents which issued in July*, 1835.

*July*

389. *Coopers' ware, making.*—Isaac Hoover, Miamisburg, Ohio, 2
390. *Stove.*—Augustin G. Ernst, city of New York, 6
391. *Straw cutting.*—Augustin G. Ernst, city of New York, 6
392. *Shoes, water proof.*—Augustin G. Ernst, city of New York, 6
393. *Vinegar, making.*—Frederick W. Boden, city of New York, 6
394. *Combing Wool.*—Samuel Couillard, city of Boston, 7
395. *Roots, cutting.*—Jonathan Clark, Hampton, Connecticut, 7
396. *Horse power.*—Thomas Mitchell, New York, 7
397. *Steam, accidents from, preventing.*—George R. Clarke, Rochester, N. Y. 7
398. *Wool, cleaning from burs, &c.*—Michael H. Simpson, city of Boston, 7
399. *Thrashing machines.*—Joseph Tyler, Brooklyn, New York, 7
400. *Water pumps.*—Amos Miner, Jordan, New York, 7
401. *Fulling mill stocks.*—E. S. Norris, Monmouth, Maine, 7
402. *Locks and latches.*—Albert Bingham, Unity, Maine, 7
403. *Piano fortes.*—Thomas Loud, city of Philadelphia, 7
404. *Mortising machine.*—Israel J. Richardson, Palmyra, N. Y. 7
405. *Mills.*—George & F. R. Baker, Tuscaloosa, Alabama, 7
406. *Chisels.*—George Page, Keene, New Hampshire, 7
407. *Linseed oil, substitute for.*—S. J. Todd & J. L. Beabody, Washington city, . . . . . 7
408. *Saw mill.*—Augustin G. Ernst, city of New York, 17
409. *Felloes, bending.*—Edward Reynolds, Haddonfield, New Jersey, 17
410. *Cultivator.*—Daniel Davis, Fredericksburg, Virginia, 17
411. *Rollers for curtains, &c.*—Henry Lawson, city of Boston, 17
412. *Churn.*—Oliver Wyman, Dedham, Massachusetts, 17
413. *Stoves, cooking.*—John Moffat, and Morton Taintor, Buffaloe, N. Y. 17
414. *Potash, manufacturing.*—H. Hartsuff & C. French, Aurelius, N. Y. 17
415. *Mortising machine.*—Imla Wright, Center Antrim, N. H. 17
416. *Water wheels.*—Isaac Powell, Laurens, New York, 17
417. *Plough.*—Timothy Miller, Pittsburgh, Pa. 17
418. *Weavers' reeds, headles and harness.*—J. A. Wilkinson, Providence, R. I. 17
419. *Looms.*—Oliver C. Burr, Millbury, Massachusetts, 17
420. *Churn floats.*—Reding Ryerson, Jay, Oxford county, Maine, 17
421. *Plough.*—Samuel Clime, Plumsted, Bucks county, Pa. 17
422. *Washing machine.*—Asa W. Soule, Portland, Maine, 18
423. *Coffins of cement.*—John White, city of New York, 18
424. *Cloth, manufacturing.*—Freeman Wolcot, Stow, Massachusetts, 21
425. *Corn shelling.*—John P. Small, Gilmanton, New Hampshire, 21
426. *Stove.*—Jordan L. Mott, city of New York, 21
427. *Corks, cutting.*—J. Cutler and I. Keyes, Putney, Vermont, 21
428. *Stoves.*—Jordan L. Mott, city of New York, 21
429. *Knobs and handles for stoves.*—Jordan L. Mott, city of New York, 21
430. *Churning.*—Hiram Phelps, Williston, Vermont, 21
431. *Fireproof chests.*—John Scott, city of Philadelphia, 21
432. *Slide valves.*—Andrew M. Eastwick, city of Philadelphia, 21
433. *Rotary steam engine.*—Mason Young, Buffaloe, New York, 21
434. *Tenons, cutting on spokes.*—William Gerrish, Portsmouth, N. H. 21
435. *Churn.*—Russel Bradley, Williston, Vermont, 21
436. *Stoves.*—David West and Ferdinand Van Sielen, Hudson, New York, 21
437. *Churn.*—William A. Herrick, Greene, Maine, 21
438. *Paper rags, cleaning.*—William Debit, Hartford, Conn. 21
439. *Height of water in boilers.*—Jesse Fox, Lowell, Mass. 21
440. *Height of water in boilers.*—Jesse Fox, Lowell, Mass. 21

## CELESTIAL PHENOMENA, FOR OCTOBER, 1835.

*Calculated by S. C. Walker.*

| Day. | H'r. | Min. | | | | | |
|---|---|---|---|---|---|---|---|
| 6 | 7 | 5 | Im. | f Piscium, | ,6, | N. 133° | V. 83° |
| 6 | 8 | 15 | Em. | | | 293° | 246° |
| 30 | 7 | 12 | Im. | $\tau'$ Aquarii, | ,6, | 130° | 119° |
| 30 | 8 | 34 | Em. | | | 298° | 305° |

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## *Meteorological Observations for June, 1835.*

| Moon. | Days. | Therm. Sun rise. | Therm. 2 P.M. | Barometer. Sun rise. | Barometer. 2 P.M. | Wind. Direction. | Force. | Water fallen in rain. | State of the weather, and Remarks. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Inches | Inches | | | Inches. | |
| ☾ | 1 | 74° | 77° | 29.70 | 29.80 | W. | Moderate. | | Clear day. |
| | 2 | 55 | 80 | .90 | .94 | W. | do. | | Clear day. |
| | 3 | 67 | 87 | .94 | .97 | SW. | do. | | Lightly cloudy. |
| | 4 | 68 | 85 | .87 | .87 | SW. | Brisk. | 0.68 | Cloudy—clear—rain. |
| | 5 | 67 | 81 | .70 | .70 | SW. | do. | | Cloudy—lightly cloudy. |
| | 6 | 65 | 80 | .70 | .80 | NW. | do. | | Clear—lightly cloudy. |
| | 7 | 63 | 79 | 30.00 | 30.15 | NE. | do. | | Cloudy—clear. |
| | 8 | 51 | 73 | .30 | .25 | NW. SE. | Moderate. | | Clear day. |
| | 9 | 52 | 76 | .15 | .05 | W. SW. | do. | | Clear day. |
| | 10 | 67 | 85 | 29.95 | 29.90 | SW. | do. | | Fog—clear. |
| ☉ | 11 | 63 | 86 | 30.00 | 30.00 | E. SE. | do. | | Fog—cloudy. |
| | 12 | 73 | 85 | 29.95 | 29.95 | S. | do. | | Cloudy—rain. |
| | 13 | 62 | 83 | .80 | .80 | W. | do. | 0.15 | Cloudy; flying clouds; rain in night |
| | 14 | 71 | 80 | .80 | .80 | SE. | do. | 0.10 | Cloudy—rain. |
| | 15 | 53 | 71 | 30.00 | 30.00 | NE. | do. | | Cloudy—flying clouds. |
| | 16 | 56 | 72 | 29.90 | 29.85 | W. | do. | | Cloudy—lightly cloudy. |
| | 17 | 60 | 72 | .90 | .75 | W. | do. | | Lightly cloudy—rain. |
| ☽ | 18 | 53 | 76 | .90 | .80 | W. | Brisk. | 0.13 | Clear—lightly cloudy. |
| | 19 | 63 | 77 | .65 | .60 | SW. | do. | | Cloudy—lightly cloudy. |
| | 20 | 57 | 69 | .54 | .64 | NW. | do. | | Clear—flying clouds. |
| | 21 | 56 | 65 | .80 | .80 | NW. | do. | | Clear day. |
| | 22 | 50 | 73 | .83 | .83 | W. | do. | | Clear day. |
| | 23 | 57 | 73 | .85 | .85 | W. | do. | | Clear day. |
| | 24 | 63 | 83 | .85 | .85 | W. | do. | | Lightly cloudy—clear. |
| | 25 | 63 | 85 | .85 | .85 | SW. S. | Moderate. | 0.88 | Cloudy—rain, thunder & lightning. |
| | 26 | 62 | 67 | .75 | .75 | NE. SE. | do. | 0.50 | Fog; flying cl'ds, rain in n't, thund |
| | 27 | 66 | 78 | .75 | .70 | SE. | do. | 1.20 | Clear; shower of hail & rain, wind |
| ⊗ | 28 | 60 | 79 | .64 | .60 | SW. | do. | | Clear, flying cl'ds. thun. & light'g |
| | 29 | 58 | 75 | .60 | .60 | W. | Brisk. | | Cloudy—flying clouds. |
| | 30 | 62 | 68 | .60 | .60 | W. | do. | | |
| | Mean | 61.23 | 76.63 | 29.83 | 29.83 | | | 3.64 | |

| | | | |
|---|---|---|---|
| | Thermometer. | | Barometer. |
| Maximum height during the month, | 87. on 3d. | | 30.30 on 8th. |
| Minimum do. . | 50. on 21st & 22d. | | 29.54 on 20th |
| Mean do. . | 68.93 . | | 29.83 |